

PC MAGAZINE

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PCs FOR LESS?

We Show You the Best Products
And the Right Places to Buy

600-MHz Pentium III Simple Scanning

The New Compaq

Lab Tests of 20

Prosignia Desktop

Dirt-Cheap

330 Really Cooks

Flatbed Scanners

FIRST LOOKS:

- 6 New Graphics Accelerators
- Macromedia Flash 4
- Norton 2000 2.0
- 3Com Palm Ille
- Packard Bell NEC Z1 LCD PC
- 4 New High-End Digital Cameras



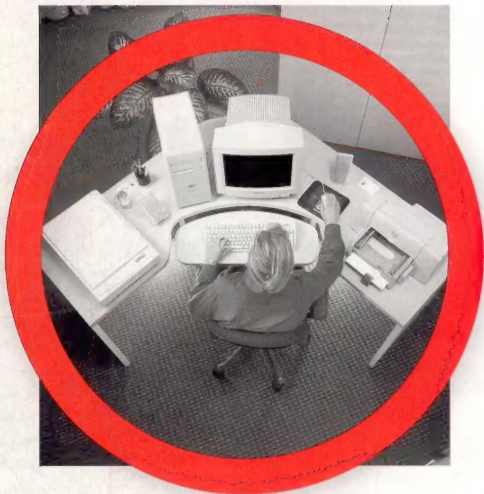
THE INDEPENDENT GUIDE TO PERSONAL COMPUTING AND THE INTERNET

VOL.18 NO.15 SEPTEMBER 1, 1999

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*Eric Schmidt, Director of Information Services, Bricker & Eckler LLP
on switching to Microsoft® Windows NT® Server 4.0 from Novell NetWare*



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Are You Really Safe Online?

A few years ago some people didn't want to use their credit card numbers online, because they were afraid others could steal the numbers. That concern never really materialized. Instead, we got new standards for creating secure links between browsers and Web sites (through protocols such as SSL). And

credit card issuers came out with clearer policies that protected online shoppers from credit card fraud, just as they do in the physical world. The result is an online world where millions of people feel comfortable paying for products and services via credit card.

Unfortunately, we can't say the same thing about other kinds of safety and security online, as we discuss in our cover feature, starting on page 101. Are you safe online? It all depends on what your definition of safety is.

Every day there are new scam artists waiting to sucker you through e-mail or other offers. Every day there is a new Web site promising something for nothing. Every day someone is offering advice in a forum that turns out to be biased. Every day someone creates a new virus. There's no one solution for any of this; instead we all have to be wary. Know whom you are talking to, and why.

That's particularly true in chat sessions and newsgroups, where users can hide behind anonymous names. What you say in such forums is public information, and the people you meet there may not be who they say they are. Teaching your children the basics of online etiquette is particularly important—such as not giving out personal information to folks they don't know.

That's fairly simple advice, but the reality is a bit more complicated and not clear-cut. Privacy is perhaps the biggest issue. Of course, you need the merchants from which you buy products to know what products you buy. Most of us would like them to keep track of such things as our preferences and sizes so they can make us better offers.

Database technology makes it easier for more sites to combine and share their information. Now it's only too easy to imagine someone gathering all sorts of information on any one of us online—from our investments to our addresses. And that's scary.

That's why most big Web sites now post privacy

policies, such as those monitored by BBBOnline and TrustE. But these seals don't guarantee privacy; instead they merely require disclosure of policies, a chance to opt out of information gathering, and some basic security. That's nice but no panacea, especially since links to such policies are usually only on home pages, not throughout the sites.

Even scarier is the potential for computers to track everything we do online automatically. When we hear about things like serial numbers on chips (such as the Intel Pentium III) or in operating systems (such as early versions of Windows 98), many of us instinctively are wary. I understand the need for security—being able to identify who is sending you messages, and so on. But I also understand why this worries many people.

At the very least, we need the ability to control what information we are giving out. The World Wide Web Consortium is working on a Platform for Privacy Preferences initiative, the results of which will be built into browsers, so you can track policies and make decisions more easily. It's a start, but it doesn't go far enough. Whether we're discussing the delivery of cookies, tracking numbers in operating systems or processors,

or information from the upcoming breed of electronic wallets that store personal information, the user needs to be in control. We need tools that let us easily turn on or off any or all of these systems.

Those of us who maintain Web sites need to understand that we must protect our customers' privacy. Many sites contain information that is confidential to our businesses, our employees, and our customers. You wouldn't trust a bank that didn't lock its doors at night; why would you trust a Web site that was similarly open?

Giving users the ability to control personal information and taking steps to protect privacy are the right thing to do. This will also turn out to be the right business decision. **PC**



More on the Web:

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answers your computing
questions every Tuesday,
exclusively at PC
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Are You Insecure?

In conjunction with this issue's cover story on online security, we want to hear your stories. Join us online and tell about your security successes and nightmares.

Shopping Spree

Have you bought a PC online yet? How did it go? Read our story about PC shopping on the Web and tell us what you bought.

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The 20 flatbed scanners we review are not only ultra-affordable (many are under \$100), they're incredibly easy to use, and they produce impressive output. *By Daniel Grotta and Sally Wiener Grotta*

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Built to order:
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users will find
the 3Com
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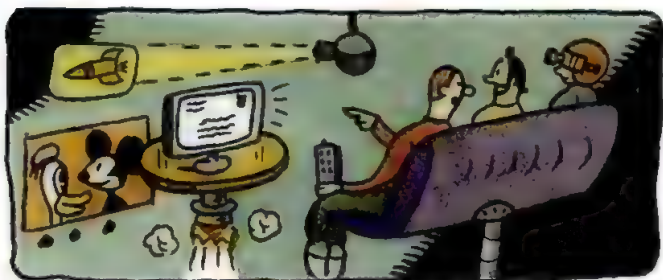
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Sofa Surfing

Broadband network access took center stage at the recent Digital Living Room conference in southern California. Faster and more flexible Internet connections are critical to everything from PC/TV convergence to applications for the connected home.

Officials from Sprint and U S West were on hand to discuss their plans for broadband deployment. "We don't believe broadband means only the delivery of fast connectivity; it's also ubiquitous and very customizable connectivity," said Len Lauer, president of Sprint's Consumer Services Group. He added that faster pipes will come quickly to homes, but they need to be available in airports and malls too.

Sprint is rolling out broad-

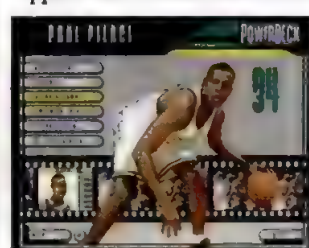
band services this year in Seattle, Kansas City, and Denver. During the conference, Lauer conducted a videoconference with one of the first "digital families" over Sprint's DSL (digital subscriber line) service, which will sell for about \$100 to \$150 a month.

Sol Trujillo, CEO of U S West, was also on hand to announce that the company has far-reaching plans for rolling out DSL in hundreds of cities. He said fast connections will help get more than a billion people on the Internet by 2002.

The best-received suggestion came from Ross Rubin, vice president of market research firm Jupiter Communications. "We should take all the lawyers working for the phone companies and get them out in vans installing DSL."

32MB Trading Cards

Take a CD-ROM, shrink it to just a few inches in diameter, and you've got a handy storage card that can hold 32MB of sports history, advertising, or business information. The latest of these miniature CD-ROMs to show up is The Upper Deck's PowerDeck series of trading



cards, which include a player's stats and video clips of his greatest moments. The e-bizCard from Multimedia Business Card can include your resume and a short video. And Lotus is distributing a video ad that fits in your wallet. The cards fit most existing CD-ROM drives.

35%

of respondents to a recent PC Magazine Online poll told us that they're ready to buy digital cameras now, while 39 percent said they'll probably get cameras next year. Another 19 percent said they already own digital cameras; only 7 percent said they have no interest in digital photography.

Web Film Editing

Whether you work for a small business or you're a home video enthusiast, editing video footage has been an expensive proposition. That's why Javu Technologies came up with VideoFarm.com, a Web site where you can edit your footage remotely for a low monthly fee.

You begin either by uploading your digitized video file to VideoFarm's home page (www.videofarm.com) or by mailing your video-



tape to VideoFarm for digitizing. You can then edit your video online using the downloadable, Java-based editing tool JavuNetwork, which lets you combine and edit video, audio, images, and text (footage is stored and edited on remote servers). It then converts your production to most standard video formats, including AVI, MPEG, Quick-

Time, and RealMedia. Once your video is complete, you can publish it on the World Wide Web.

VideoFarm.com works on 56K or faster connections and costs from \$49 to \$89 per month.

Search Engines' Tiny Bite

Web search engines can't seem to keep up with the explosive growth in the number of Web pages, and the situation is only getting worse. NEC Research Institute scientists Steve Lawrence and C. Lee Giles recently put 11 of the top search engines to the test and discovered that even the best of the bunch—Northern Light—covered a mere 16 percent of the 800 million Web pages posted in cyberspace as of February 1999. That's up from the 320 million pages they counted in December 1997. You can obtain a substantial improvement in Web coverage using metasearch engines such as MetaCrawler, which combine the results of multiple engines, the scientists report.

According to the NEC team, there are diminishing returns to indexing the entire Web, because most queries can be satisfied with a relatively small database.

Search engine	Percent of the Web covered
Northern Light	16.0
AltaVista	15.5
Snap.com	15.5
HotBot	11.3
msn.com	8.5
Infoseek	8.0
Google	7.8
Yahoo!	7.4
Excite	5.9
Lycos	2.5
EuroSeek	2.2

Source: NEC Research Institute, 1999

What's Your Net IQ?

Take heed from a company that really knows how to run a successful Internet business. Cisco Systems, the leading provider of Internet hardware, has developed the Internet Quotient, a quiz posted on its Web site that can help determine your company's potential in the Internet economy.

After you answer a series of 20 yes/no questions, the Internet Quotient quiz instantly tallies your responses and delivers your score. Among the questions asked: Is your company a

sought-out partner? Are third parties spontaneously creating Internet technologies and services that support your company? Do you use Internet technology to anticipate customer behaviors and recognize market changes? Does your company have experience managing multiple strategic relationships? A top score—160 to 200 points—will earn you the title "Internet Visionary." A straggler scoring below 40 had best rethink his or her Internet strategy. Take the quiz yourself at www.cisco.com/warp/public/750/indicator/quiz-old.html.



Personal Reception

Want to hear great sound from all those MP3 files you've downloaded? Check out the new Yamaha RP-U100 personal receiver (\$499 list), a 30-watts-per-channel stereo receiver with a USB connector that lets you stream digital audio directly from the computer. The same USB connection also lets you control all the receiver's functions from your PC and store up to 208 radio stations.

Going digital means avoiding the mediocre quality of many PC sound cards and the RF emissions inside PCs that can distort analog sound. The RP-U100 accepts digital signals from your PC and then amplifies and feeds them to a pair of speakers as two-channel stereo or as virtual Dolby Digital surround sound. Its custom digital signal processor can emulate a concert hall, a jazz club, or a movie theater. You can also connect an outboard CD player, tape deck, or Sony MiniDisc recorder to the RP-U100 and pass the signal back to the PC to process or record your own music.

Top-Selling Retail Software

1	Norton AntiVirus 5.0	Symantec
2	Microsoft Windows 98 Upgrade	Microsoft
3	Star Wars: Episode I: The Phantom Menace	LucasArts
4	Norton System Works 2.0	Symantec
5	Baldur's Gate: Tales Of Sword Coast	Interplay Productions
6	The Print Shop Deluxe 6.0	Learning Company
7	McAfee VirusScan 4.0 Classic	Network Associates
8	SimCity 3000	Electronic Arts
9	Star Wars: Episode I: Racer	LucasArts
10	RollerCoaster Tycoon	Hasbro Interactive

Source: PC Data: June, 1999

Viruses' Economic Drain

As the number of Internet users surged by 50 percent from January 1998 to January 1999—bringing the total to 67.5 million—the economic impact of virus attacks soared as well. Businesses lost \$7.6 billion in the first two quarters of 1999 as a result of disabled computers, according to research firm Computer Economics.

"The attacks are a form of economic terrorism, and the economic impact of each new attack will be increasingly damaging to productivity," says Michael Erbschloe, vice president of research. He adds that while the frequency of the attacks will continue at its current rate, the nature of the attacks will become more severe, and organizations will see longer periods of downtime. His advice to businesses: fund IT security programs. "Very few IT security

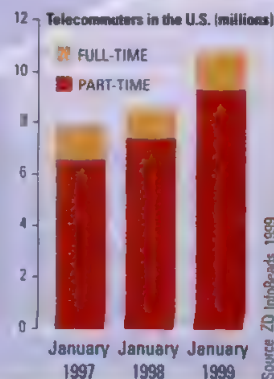


programs are supported well, and most budgets should be at least doubled to handle these attacks," he says.

In a recent survey of IS professionals conducted by Hewlett-Packard, more than 20 percent of respondents said their companies lost money or productivity because of the Melissa virus. More than half said they lack confidence in their organizations' virus protection programs.

There's No Place like Home

As of January 1999, there were almost 11 million telecommuters in the U.S., up by more than 28 percent from the previous year. Most of the increase can be attributed to occasional telecommuters, who work mainly in the office but sometimes from home. Trust and productivity concerns are receding as inhibitors to telecommuting, while Internet-based virtual private networks, extranets, and DSL technologies are proliferating.



THIS ISSUE'S CONTRIBUTORS: Bill Howard, Carol Levin, Sharon Nash, Sebastian Rupley.

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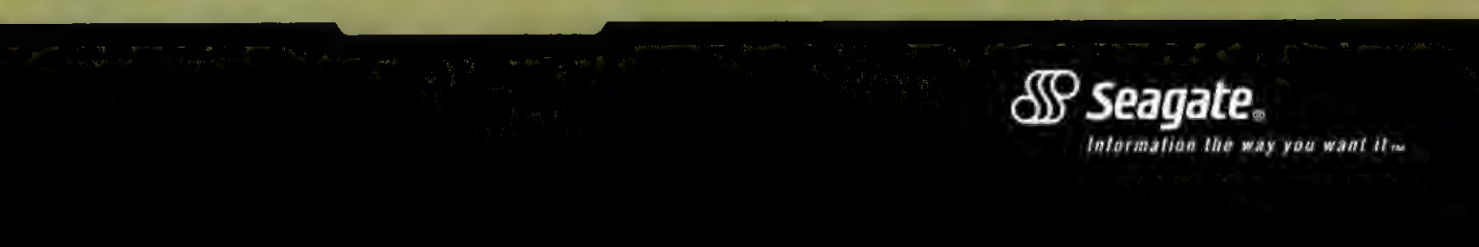
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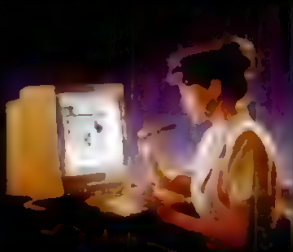
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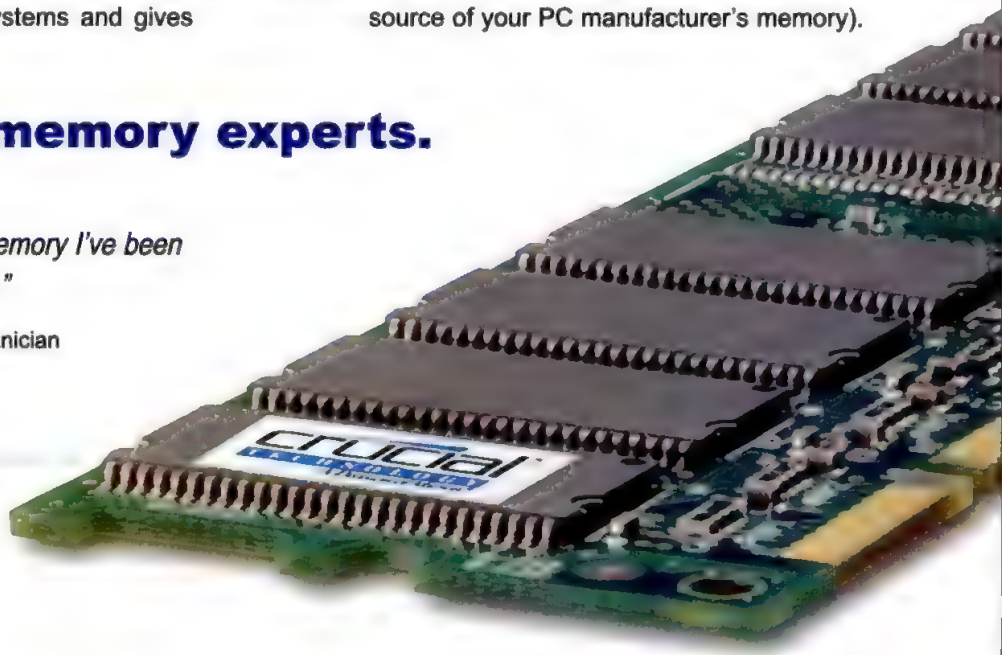
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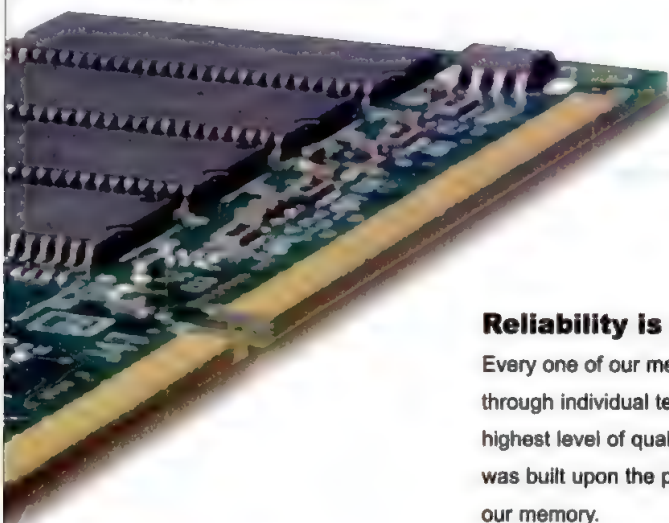
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LETTERS

FUTURE TECHNOLOGY

I just finished reading the "Little Devices Will Think" section of your "Future Technology" cover story (June 22). Starting the dishwasher from my cell phone or having my refrigerator order my milk online does not seem far-fetched; it seems a ludicrous use of questionable technology from a bloated and self-serving industry. My refrigerator is approximately ten years old. It's quiet, it's energy efficient, it never breaks down, and it keeps my beer cold.

Are you telling me that this appliance can be improved by adding 32MB of RAM, an Ethernet connection, a touch screen, a bar code scanner, and Windows 98? Why should I buy a new refrigerator, incur phone and ISP charges, endure system crashes and endless upgrades (presumably the Microsoft service packs will come with the number of my local refrigerator repair guy), broadcast my buying habits and preferences to the entire Web, and give up the privilege of squeezing the bread and checking the eggs before buying?

MICHAEL HOLMES
via the Internet

I enjoyed the articles in the June 22 issue regarding the future of information technology. In the section on displays ("You'll Look at Computers in a Whole New Way"), you omitted a technology that, as an amateur, I find remarkably exciting.

I'm referring to organic light-emitting diode (OLED) technology, which is being developed by a company called Universal Display Corp. (www.universaldisplay.com). OLEDs combine high efficiency, high resolution, and low manufacturing costs.

Most of the technologies described in your article are far more complex. They appear to have the same complexity and high manufacturing costs that limit the size and availability of today's flat panels.

I can see OLEDs doing to current display technologies—CRT, LCD, and plasma—

what electronic calculators did to slide rules, and at least as quickly. Since the costs are low, and OLEDs can apparently be manufactured on existing equipment, they are likely to enter consumer markets—flat-screen TVs, and so on. Such wide applicability would likely create a manufacturing scale that would further reduce costs.

JIM FOSTER
via the Internet

THERMAL NOISE

Your article on the generation of random numbers using thermal noise ("Safety in Random Numbers," Trends, June 22) was intriguing. But the explanation for the origins of thermal noise was a bit wide of the mark. As any radio engineer can tell you, thermal noise is a

"My refrigerator is quiet and energy efficient and keeps my beer cold."

fact of life in any electronic device operating above absolute zero. Noise is readily observable in almost any sensitive electronic amplifier and is a fundamental physical property from which there is no escape. Harnessing thermal noise to produce random numbers has long been practiced in varying degrees in laboratory settings; what is new is that we will soon see it become an integral part of the computer on our desktop.

ALAN R. WHITNEY
Westford, Massachusetts

FILM SPEED AHEAD

I've never been able to find information on how a digital camera's CCD compares with film speed. In other words, under common lighting conditions, using whatever f-stop and shutter speed a given digital camera uses, what speed film will give the proper exposure? Even *Popular Photography* seems to leave out this information, surely relevant to anyone even slightly technically proficient with photography. And one would like to know whether this speed is something that is or has been improving over the years.

MICHAEL ZARKY
Moorpark, California

You can find this information in the ISO equivalency, which is sometimes included in a camera's specs. If you can't find it there, try looking at the manufacturer's Web site. Roughly 80 percent of digital cameras are equivalent to ISO 100. This speed is not really improving,

but it can be enhanced, although with such penalties as increased electronic noise.—Ed.

TICKETS TO GO

Thank you for Jake Kirchner's mention of Microsoft Expedia's funny tendency to increase the purchase price for tickets once the tickets have been reserved (June 22). I asked the folks at Microsoft Expedia (www.expedia.com) if this was a bait-and-switch deal when it happened to me. Their excuse—that the airlines frequently change prices, and the Expedia site updates only after someone has reserved a ticket—seems weak to me.

Competition solves many problems, however. Travelocity (www.travelocity.com) had the same tickets at the same price, and they sold the tickets for the advertised price. Perhaps the folks at Expedia will pay attention now that your magazine has highlighted the problem as well. For me, Travelocity already has my loyalty.

TOM MCCONNELL
Washington

YELLOWED PAGES

With regard to Bill Howard's column "Palms Go Wireless" about the future of hand-held wireless computing, I couldn't agree more. We'll all be using them in a few years, for everything from movie tickets to hotel reservations to driving directions. I find myself using the Internet as my primary source of information—I can't remember the last time I opened the phone book and checked the yellow pages.

MARK S. JACKSON
via the Internet

A LETTER OF SUBLIMATION

John C. Dvorak's article regarding DOOM and the Littleton tragedy ("The DOOM Factor," June 22) makes use of the term *sublimation*. The context in which Dvorak refers to sublimation suggests that it means to grow tired of, or in his words, "get pooped." When he talks about getting "something out of your system," he gets closer to the true meaning. Actually, sublimation is the redirection of aggressive impulses to more healthy and productive pursuits.

Any sublimation going on in DOOM might refer to improved hand/eye coordination and strategic thinking. No doubt there are countless better examples of sublimation, including the channeling of aggressive urges into athletics. Ironically, the Littleton gunmen attempt-

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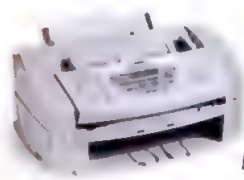
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ed to single out students involved in sports, those who were probably more successful than the gunmen themselves in the process of sublimation.

STEVEN FRITZ
via the Internet

REAL OR IMAGINED?

I just finished your article in the June 22 issue, "The Real Music Thing" (First Looks). You give the impression that RealJukebox is the next big thing. Not necessarily.

First of all, it's a beta program. Though it may seem like the best right now, there is a good possibility that what you've reviewed won't be the finished product. Also, I'm not so thrilled by the fact that all the files you record to your hard disk can't go anywhere; e-mailing music to friends and others is the best part of this whole genre.

I have found the Xing interface to be clean and easy to use (even for a novice), and I like being able to let my music travel. Sometimes we are all loath to give Microsoft its due, but I'm happy to use a Microsoft product if it does what I need it to do. As of right now, as far as I can see, there are still other programs in the marketplace that can offer more than RealJukebox can.

PAULA WESSON
Stowe, Vermont

These days, many software programs (including Web browsers) are released to the public over the Web in beta (or prerelease) form. Our policy is to evaluate such software when it becomes generally available. Future versions of RealJukebox will certainly evolve. As for e-mailing music to friends, yes, that's an important part of the MP3 phenomenon, but remember that copying and distributing copyrighted music to others is illegal.—Ed.

THE DIGITAL MENACE

Your article (Trends, June 22) about the digital distribution of *Star Wars: Episode I—The Phantom Menace* spoke of the quality of the images. I was very pleased with the video and the sound. For the first time in a long time, the sound level was apparently not set by one of the hearing-impaired teens who seem to run the cineplexes these days. But I was under the impression that the last viewing was supposed to be as good as the first. I have seen the film only twice, but there was a distinct skip in one part at one of our local theaters just a week after my first viewing. I thought this was not supposed to happen.

PAUL McLAUGHLIN
via the Internet

CORPORATE PCs

Donna Currie (Letters, June 22) questioned whether proprietary BIOSs make sense in PCs for a corporate environment, since busi-

Corrections and Amplifications

In our August roundup of notebook PCs, a fact-checking error led to some incorrect specifications being listed in the reviews, though the information was correct in the Summary of Features table. The Compaq Presario 1925 has 84MB of RAM. The Dell Inspiron 7000 A400LT has 8MB of video memory, and the Gateway Solo 3150 LS has a 2X DVD-ROM drive. The Micro Express MP6366V has a 14.1-inch TFT display. In the Benchmark Tests section, the CPU for the IBM ThinkPad 390E should have read Mobile Pentium II/300, and the model number for the ACT Brilianta should have read NI-7134.

In our story "Color Network Printers" (May 26), we incorrectly stated the price, as tested, of the Minolta Color PageWorks Ex in our Summary of Features table, p. 184. The actual price is \$4,280. We also neglected to mention that the printer came with a 2.1GB hard disk and 16MB of extra RAM.

In our story "Polish It" (June 8), we made an incorrect statement about Outpost.com's Affiliate Network program. Affiliates of Outpost.com earn commissions on both software and hardware.

nesses (in her experience) have a variety of computer brands and don't replace them all at once. That may have been true in the past, but some companies have already moved to universal replacement with identical machines.

The corporate environment that I work in replaced essentially all of its PCs in 1998—over 25,000 HP workstations and over 4,000 laptops, at 700 locations in more than 100 countries. At the time when the hardware had to be qualified on our 1,600-plus applications, HP was about to replace our selected laptop model, so road warriors were given a second selection from another manufacturer. We wound up with one desktop solution and two different laptop models—not ideal, but close.

At first, many of us (brought up in just the environment that Ms. Currie describes) questioned whether buying the same model for clerks and CAD designers and engineers was cost-effective. Yes, there were deployment problems along the way, but now that the dust has settled, it looks like a success to me. Support costs have been reduced enough to pay for the new hardware. Over 3,000 applications can be easily downloaded from the WAN, and they can be relied on to work.

Ms. Currie describes a scenario of the problems trying to recover a crashed hard disk when you have standardized machines. This has happened to us, and since we do keep an inventory of spare standard machines and have expertise working on them, we have been able to recover data. If this had happened on a oddball legacy machine, the data would probably have been lost.

BOB BURLESON
Houston

THE NEW LABS

After reading about your new labs ("PC Labs: New and Improved," June 8), I got this feeling of awe and excitement that could be equaled only by watching Tim Allen walk through the biggest warehouse of the newest, biggest, and baddest tools. Playing—er—working in that lab must be a dream come true. I currently work as technical support for a large international firm and have been lucky enough to add an older Compaq ProLiant server with a RAID Level 5 tower to my home computer,

which is a custom-built Pentium II/350 SCSI system that has an external tower with four SCSI disks and redundant power. Until now, I thought I had a fun play area. No one will ever be able to say that you're not equipped to test everything—or anything.

MARK HODGES
via the Internet

WWW...ON, FORGET IT!

Everyone is always complaining about how "www" is so hard to say, since each letter has three syllables. Why not make it simpler by just saying "Web," since that is what it is, as in World Wide Web? Example: Web dot pc magazine dot com. What could be simpler?

RICH DAHL
via the Internet

My shop has reduced the "www" pronunciation problem by two-thirds: "dub-dub-dub." Dare we reduce it to "dub?"

TERRY MARSHALL
via the Internet

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THE Computer PAGE.

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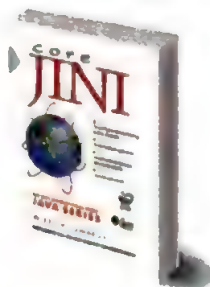
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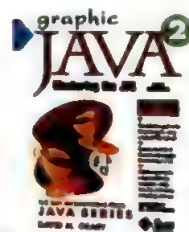
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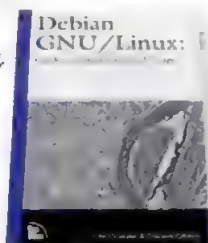


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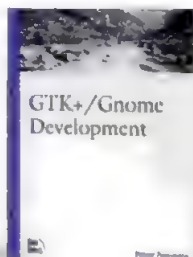


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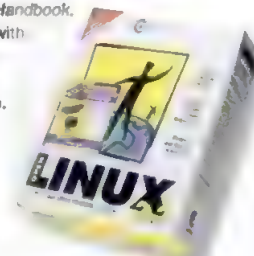


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Get Ready for 64-Bit Computing

Intel gears up for the new millennium.

The transition from 32-bit to 64-bit computing, expected to be the next significant advance for the computer industry, reached another milestone recently, when Intel disclosed details of its IA-64 instruction set.

Albert Yu, senior vice president and general manager of Intel's Microprocessor Products Group, compared the enormity of the transition with that from Intel's 16-bit processor architectures to the 32-bit 80386 in 1985.

This latest disclosure gives software developers a head start in readying their applications for the first shipment of IA-64 systems. Code-named Merced, McKinley, Madison, and Deerfield, the first 64-bit chips will be for high-end servers and workstations; it'll be many years before IA-64 systems hit desktops en masse.

A \$250 million venture capital fund called the IA-64 Fund will be used to finance IA-64 software development. Because server and workstation applications are only a fraction of the mainstream application market, Intel can focus development efforts to ensure that key

software is ready when the hardware ships.

The 64-bit computing platform uses 64-bit address spaces for certain high-end applications—rather than the 32-bit ones used today—as well as EPIC (Explicitly Parallel Instruction Computing) technology.

The advantages to these special features include the huge number of registers, predicated execution, speculation, and rotating registers for assisting software pipelining.

A significant number of IA-64's architectural details are not public; Intel has yet to disclose operating system development guides or Merced microarchitecture details. Intel will most likely roll these out in stages, adding to the suspense for technology enthusiasts while providing needed resources for the industry.

Much development effort for IA-64 is al-

ready under way. Merced chip set, motherboard, and BIOS work have been in the pipeline for some time, and operating-system programmers have been working with Intel using prerelease IA-64 compilers and processor emulators to test their IA-64 code. Key application developers have had access to software-based Merced processor simulators, and numerous other software developers will gain access to prototype Merced hardware systems toward the end of 1999. Intel has also set up a number of porting centers to help developers port their code from 32-bit to 64-bit, or from other computing platforms to IA-64.

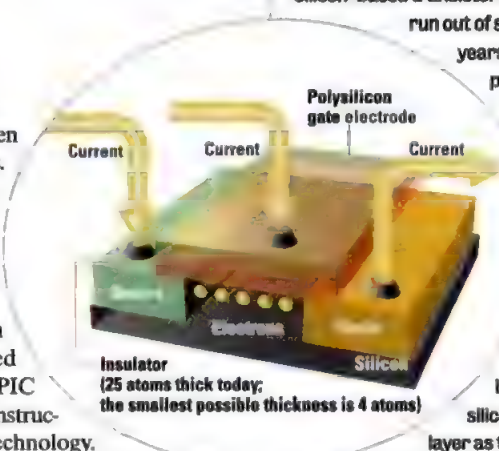
More technical details will follow in the coming months. Until then, the IA-64 instruction set architecture already released should keep software developers and technical enthusiasts busy for months.—*Nick Stam*

Silicon's End

Is there any end to smaller, faster, cheaper microprocessors? Well, yes. But the end may be further away than previously thought.

Silicon-based transistor technology may not run out of steam for a dozen years, instead of the previous estimate of fewer than six years, report researchers at Lucent Technologies' Bell Labs.

Conventional wisdom within the semiconductor industry has identified a chip's silicon dioxide insulating layer as the limiting factor for producing increasingly smaller transistors. The insulating layer on today's chips is 25 atoms thick, but Bell Labs' researchers recently produced a 5-atom layer, the thinnest ever made. They also showed that a 4-atom layer is the physical limit for silicon dioxide-based insulators. These results suggest that an alternative insulating material must be found before 2012. If one is not found, totally new semiconductor technologies will be needed.—*Carol Levin*



XML on Autopilot

The Web makes itself over frequently, and few technologies are more central to the Web's current makeover than XML (eXtensible Markup Language), a common way of describing data on the Web. Now a new XML protocol called XML RPC (Remote Procedure Call)—designed to let developers script automated routines that make use of XML—is gaining momentum as well.

Two forces propelling XML are the need for better Web searching and the need for a common way of describing business documents, which will in turn allow for easier business-to-business transactions. XML is emerging as the card-catalog technology for this, and XML RPC is a strong contender for the way developers might trigger sophisticated applications.

Procedure calls take place whenever you interact with the computer—say, by clicking your mouse. They can also be triggered remotely and automatically by an event or script on another computer. Several developers see promise in extending remote procedure calls to XML-based information, which is where XML RPC comes in. Think of it as an XML-based Esperanto, understood by remote machines on different platforms. Many companies see this as essential to e-commerce.

"Up until now, it has been extremely difficult for companies to conduct business easily over



the Internet, because of the lack of a single technical vocabulary for describing business processes," said Microsoft CEO Bill Gates in announcing BizTalk, a Microsoft BackOffice server product based on XML.

One company, webMethods, has produced an XML RPC application for use with BizTalk, designed to exchange documents across platforms automatically.—*Sebastian Rupley*



Resolving Scanner Ratings Confusion



Every time PC Magazine Labs tests scanners, we decide how best to report maximum optical resolution. Manufacturers like to use numbers such as 600-by-1,200, but the higher number can be somewhat misleading.

The *optical* resolution is determined by the scanner's sensor—usually a CCD array—and the number of individual elements in the sensor. For example, a 600- by 1,200-dot-per-inch scanner has 600 elements per inch. But the sensor reads only one scan line at a time. The second number is the *mechanical* resolution, which indi-

ity, however, whether a 600-dpi sensing element can resolve 600 lines per inch depends on the quality of the optics. And whether a 600-dpi mechanical resolution can resolve 600 lines per inch depends on the precision of the stepper motor.

As you might expect, a 1,200-dpi stepper motor will be more precise at 600 dpi than a 600-dpi stepper motor. And the stepper motor in a 600- by 2,400-dpi scanner will be even more precise. To determine a scanner's maximum optical resolution, use the lower number. In the absence of empirical results, use the higher number to determine the likelihood that the scanner can deliver the optical resolution it promises.

On a related subject, you'll get the best-looking output if the pixels per inch (ppi) in your image matches your printer's dpi, which means that sometimes you'll need a higher resolution than the maximum optical resolution. But this doesn't mean that the best place to do the interpolation is during the scan process.

With continuous-tone images, you'll get the best results from a technique that creates new, interpolated pixels by averaging the color values of all the pixels around each new one. A scanner can't do that during the scan process, because it has to insert the new pixels for each line before it gets to the next line. As a result,

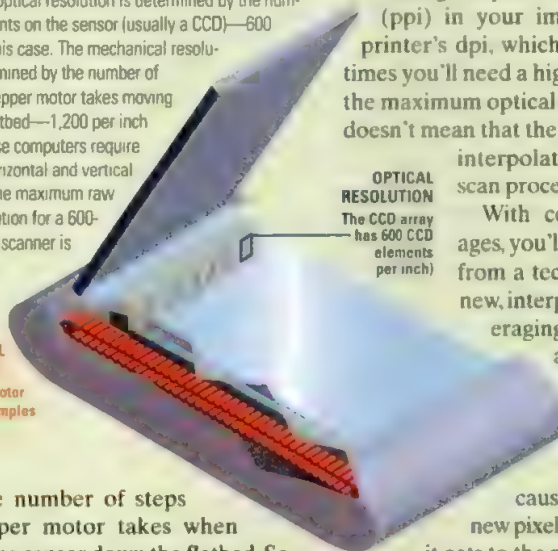
using a scanner's ability to interpolate to a higher resolution can degrade your pictures. Once you've finished a scan and imported it into a program like Photoshop, you can improve the image by interpolation.

Line art is a different story; you don't want to create the interpolated pixels with an averaged gray level. You want each pixel to be either black or white (or for color line art, full color or white). This approach does not need to take the next scan line into account. So using the scanner's interpolation will improve your image, but using the more sophisticated interpolation in image-editing programs will degrade your image. The rule of thumb is to interpolate when scanning line art and to interpolate in an image-editing program for continuous-tone images.—*M. David Stone*

Optical vs. Mechanical

A scanner's optical resolution is determined by the number of elements on the sensor (usually a CCD)—600 per inch in this case. The mechanical resolution is determined by the number of steps the stepper motor takes moving down the flatbed—1,200 per inch here. Because computers require the same horizontal and vertical resolution, the maximum raw image resolution for a 600- by 1,200-dpi scanner is 600-by-600.

MECHANICAL RESOLUTION
The stepper motor takes 1,200 samples per inch



icates the number of steps the stepper motor takes when moving the sensor down the flatbed. So a 600- by 1,200-dpi scanner offers a 600-dpi optical resolution and a 1,200-dpi mechanical resolution.

The problem with using a number such as 600-by-1,200 for a scanner's resolution is that computers need the image handed to them with the same resolution vertically and horizontally. In turn, this means that for a 600- by 1,200-dpi scanner, 600-by-600 is the maximum resolution without interpolation, which is another way of saying that the maximum raw image resolution for a 600- by 1,200-dpi scanner is 600-by-600.

Although the second number is misleading, it isn't meaningless. To understand why, you have to understand that the claimed resolution isn't always the resolution you get. By definition, resolution means the ability to resolve detail. In real-

STORAGE

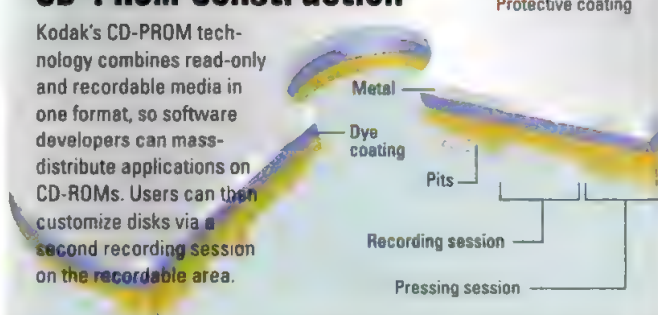
New CD Writes Twice

The new Kodak Picture CD format has achieved something that amateur photographers have long wanted: the ability to use film cameras to store and use images digitally. When you have your film developed and printed, Kodak will provide a CD with all of your images plus an assortment of preloaded software. Although the technology used to produce Picture CD is a conventional CD-R engine, Kodak will shift next year to a new format called CD-PROM (compact disk-programmable ROM), which combines recordable and read-only formats in a single disk.

Until now, there were two distinct but wholly incompatible methods of encoding CDs or DVDs: press and burn. A *pressed* CD or DVD instantly encodes all data on a single groove at once; *burning* involves creating billions of pits just below the surface that read as either zeroes

CD-PROM Construction

Kodak's CD-PROM technology combines read-only and recordable media in one format, so software developers can mass-distribute applications on CD-ROMs. Users can then customize disks via a second recording session on the recordable area.



or ones. Because of the physical difference between the pits and grooves, it has not been possible for CD or DVD drives to make the transition between the two technologies.

The hybrid CD-PROM technology incorpo-

rates a pit and groove-like transitional encoding, called *modulated grooves*, that moves between prerecording and customized recording.

CD-PROMs can be read in any CD-ROM or DVD-RAM drive. Accordingly, Kodak can

use its assembly line to press prerecorded software on a portion of a CD's 680MB and then ship the disk to an authorized photofinisher, who can burn a customer's photos on the disk's unused portion.

CD-PROMs can't be copied. A serial number burned on each CD needs to be referenced during an install. At

least for the present, there are no plans to sell consumers the modulated-groove equipment capable of pressing and recording data. But CD-PROMs may show up early next year.

—Daniel Grotta and Sally Wiener Grotta

Big-Bucks Bush Races to Catch Internet AI



Jake Kirchner

The presidential candidates have made Silicon Valley a key place to look for support and campaign contributions, a testament to the importance of high technology in our society and its significance in our economy. Al Gore, the Democratic front-runner, has for years been known for his interest in high tech in general and computing in particular. Now the surging campaign of Texas governor George W. Bush is hustling to catch up to Internet AI.

A while back, I detailed Gore's high-tech policies and agendas in this space (December 1, 1998), and I promised to do the same for other candidates throughout the campaign. I note again that a candidate's stance on technology may not be the one issue that should swing your vote, but at the least this is an important topic of public policy and one that will be prominent in campaign debates.

There's no question as to the power of Bush's campaign. He has far outdistanced potential rivals in picking up endorsements and cash. Now he's turned that prowess in the direction of the computing industry, announcing recently the formation of the star-packed Information Technology Advisory Council, headlined by Dell Computer's Michael Dell, James Barksdale (recently of Netscape), and seven other industry CEOs and presidents, including Carol Bartz (Autodesk), John Chambers (Cisco Systems), Tom Engibus (Texas Instruments), Robert Herbold (Microsoft), and Ray Lane (Oracle).

In announcing this committee, Bush laid out three major goals: (1) to lift barriers to innovation and fight efforts in the U.S. and overseas to impose new obstacles, (2) to help the

U.S. develop and maintain a workforce appropriate to our high-tech needs, and (3) to establish a stable environment for research and innovation without government direction. These goals are suitably lofty and predictably vague, but it's true that Bush has made high tech one of the keystones of his campaign. As governor, he also has a record of making decisions that benefit the industry, which helps explain these executives' eagerness to support him publicly.

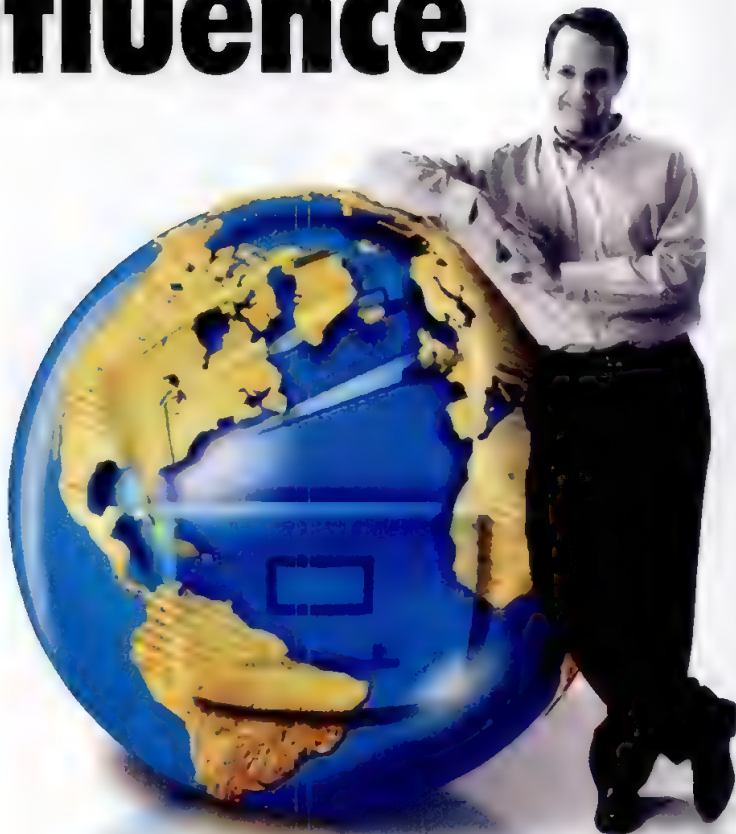
For details of Bush's high-tech record and policy, check out his campaign's Web site, www.georgewebush.com. Here's a quick rundown of the key parts of both.

Bush supported and signed legislation limiting legal liability for companies that make good-faith efforts to correct Y2K problems. This is a boon for computing vendors. He also supported tax credits for R & D by private companies, was on the industry's side in its effort to cut lawsuits aimed at high-tech companies, and claims success in cutting the costs of Internet access for Texans.

His plan for high tech pays homage to the importance of technology to our economy. He hopes to make the Internet a duty-free and tariff-free zone worldwide, combat the piracy of intellectual property, and develop international standards for e-commerce. Bush's plan also allows more work permits for foreigners with high-tech skills and sets higher standards for U.S. schools to help them prepare a more technologically skilled workforce.

Although Bush doesn't have the same long-term record of technology appreciation that Gore has, he's quickly learned to push the right buttons. Gore speaks of the government's ability to promote technology access for all Americans, while Bush urges the government to create an environment in which tech industries can flourish on their own. It'll be fascinating to see them debate this topic head to head.

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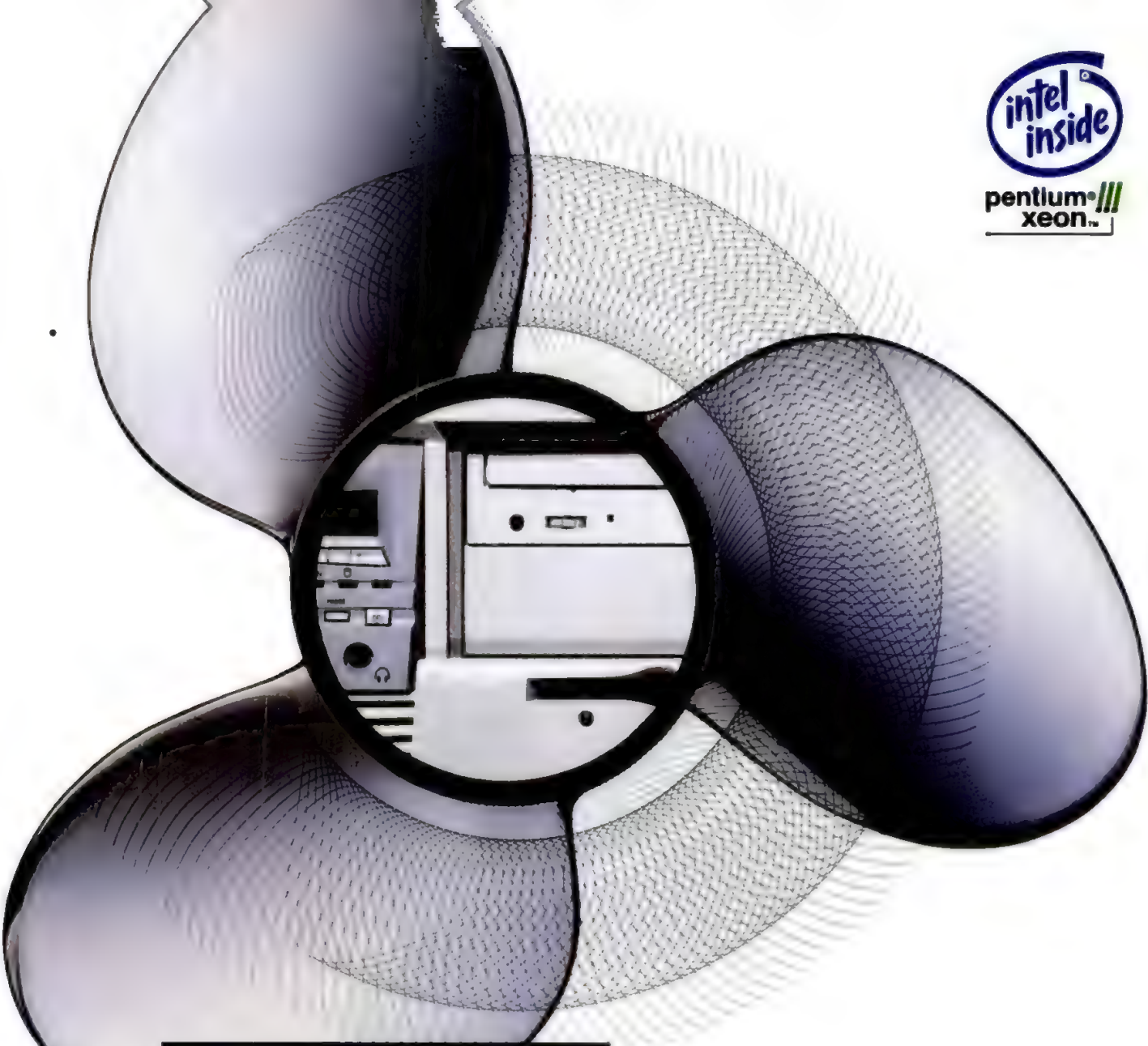
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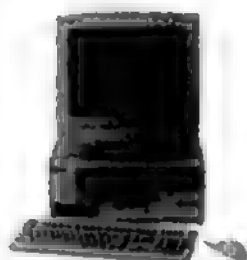
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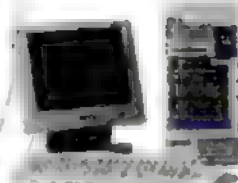
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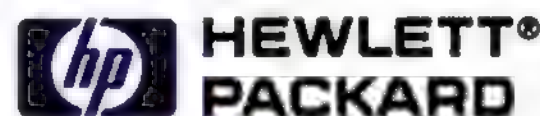
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NETWORKING

Fiber Finds Its Footing

High-bandwidth fiber data connections from corporate networks to desktop PCs have been about as practical as fiber connections for the final stretch of phone line from the street to your home. In the past few years, however, the price of fiber components has dropped significantly and ease of installation has improved. The result: Fiber to the desktop is starting to look like a more practical alternative to copper cabling when a network upgrade is in order.

The advantages to fiber optic cabling are undisputed. Multimode fiber supports 50 times the bandwidth of the best Category 5 cabling, which guarantees support for future high-bandwidth applications without requiring cable upgrades to support new standards. "Fiber gives you enough headroom to grow and bypass future upgrades," says John Curtis of The Tolly Group, a network-testing firm.

By contrast, copper cabling can run at 100 MHz and support Gigabit Ethernet, but it requires an upgrade to Category 5-E cabling. The industry is also looking toward Category 6, which runs at up to 250 MHz, and Category 7, which reaches 600 MHz.

In addition, fiber reaches 100 times the distance of Category 5 cabling. Unlike copper cabling, fiber is immune to electromagnetic interference, which can lead to an unstable network. And glass fiber is significantly stronger than copper. Despite these advantages, fiber's sky-high cost has slowed its adoption on the desktop; its use as an interconnect between networks has been more viable.

Now the stumbling blocks are starting to crumble. "Companies should at least look at fiber and not dismiss it out of hand," says David Dines, an analyst at market research firm Aberdeen Group. "In the long term, fiber is better," he says. According to 3M, a leading maker of fiber components, fiber now commands a 12 to 18 percent premium over copper cabling. In the past, fiber had cost three to seven times as much as copper cable. The price of adapter cards has dropped recently, from close to \$300 to the low \$100s. And the price of passive components (cable, terminations, patch cords) has dropped as well (see chart).

The perception that fiber is difficult to work with is also changing, says Vincent Wong, CEO of Gemflex, a developer of fiber components. One significant advance in this area is the introduction of a new generation of small connectors, such as the VF-45 intercon-

nect, which is the same size as the conventional RJ-45 connector. "The argument is becoming more compelling for customers," he adds. There are still obstacles to widespread adop-

tion, however. Most significant, computer makers aren't yet on board. On a PC, a \$10 fiber connector is still a big problem.

Meanwhile, a new kind of fiber optic technology known as dense wavelength division multiplexing (DWDM) is undergoing tests.

By transmitting multiple light frequencies through a single strand of fiber, DWDM substantially increases its capacity. The International Center for Advanced Internet Technologies, located at Northwestern University, is now testing DWDM networks.

Telcordia Technologies (formerly Bellcore) is also investing in optical network research as part of the Defense Department's Multi-

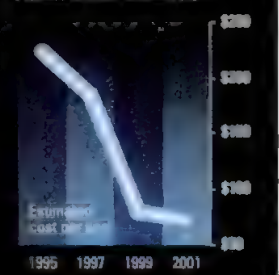
A Cost-Effective Connection

With the price of fiber components dropping, a fiber connection to the desktop can be a long-term, cost-effective alternative to copper.

TOTAL COST PER LINE FOR CABLE CONNECTIONS

Standard fiber	\$378
Category 6 cabling	\$364
Category 5-E cabling	\$249
3M fiber cabling	\$150

COST OF PASSIVE FIBER COMPONENTS



INTERNET

Cyberservices for Your Home

The days when Internet access meant untold hours of surfing the Web, catching up on e-mail, and instant messaging will seem positively prehistoric once a whole new bundle of cyberservices arrives at your front door early next year.

Imagine driving down the highway and realizing you've forgotten to arm your house alarm. No problem. Just call it up from your cellular phone's Web browser and turn the alarm on. You're at work when the doorbell at home rings. Call up your house's home page and click on the Web cam—the one monitoring the front door—from your office PC's browser to check who's there. It's a repairman you're expecting, so you unlock the door remotely to let him in. You're about to leave the office and want to switch on the air conditioner in the living room so the house is nice and cool when you arrive. Just click on the air conditioner button

on your browser and it's on.

The technology enabling such services requires the coordinated teamwork of telecommunications companies supplying high-speed DSL connections into homes, software developers writing the applications that link all the devices together, hardware makers building a new class of wireless phones and networking gear, and Internet service providers, as well as providers of such other services as home security, medical alert, and electricity.

All of these players have come together for a trial run in Ottawa, in which ten lucky Bell Canada customers will be supplied with a Residential Services Gateway—a box loaded with a DSL-based Nortel 1-Meg modem, IBM software, and CE-Bus support for control of appliances over 100-volt lines. Commercial availability is slated for the first quarter of 2000.—Carol Levin



Web Calendars

By Doug Beizer

You love your notebook computer, you couldn't live without your hand-held organizer, and your desktop computer is your workhorse. So why are you still scribbling down appointments on the paper calendar you got for opening a new savings account? There are dozens of free, Web-based calendars to choose from. Because they're Web-based, you can access and edit them from any computer, regardless of where you are. And virtually all Web-based calendars sync up with those on hand-held devices. Some calendars are intended for private use only; others have group functions that let friends, family, or business associates view or even edit your entries. The following sites should help you build the perfect calendar for your specific needs.



Keep a Private Social Calendar

► Keeping your social life in order can be just as complicated as keeping your professional life together. **When.com's** Event Tracker (www.when.com) helps you keep track of movie release dates, curtain times for the local opera, or when your favorite sports team is playing. In your When.com calendar's daily view, all your chosen events (from an extensive list provided by the company) appear in a frame to the right of your calendar. Just click the add button next to an event to add it to your calendar.

Keep a Business Calendar

► A day-planner book is a working person's best friend, and **Day-Timer Digital** (www.digital.daytimer.com) is reminiscent of the old paper planners, with a familiar, booklike layout. Tabs let you alternate easily between day, week, month, and to-do list views. It also includes a public calendar option. **MagicalDesk** (www.magicaldesk.com) has only a basic monthly view but lets you easily convert incoming MagicalDesk e-mail (username@magicaldesk.com) into calendar appointments. Just open a message and click on the convert-

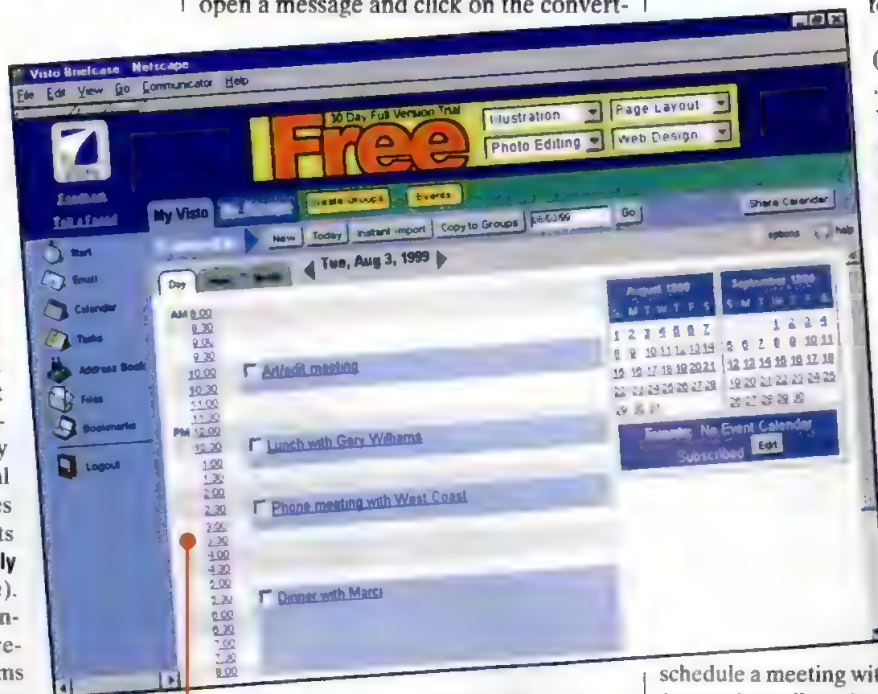
to-calendar icon. MagicalDesk's To Do List also syncs up with its calendar. **Visto's** calendar (www.visto.com) lays out your day in half-hour increments in its day view or lets you choose weekly or monthly views. The calendar's Instant Import button lets you import Microsoft Outlook or Palm Desktop calendars, but you need Microsoft Internet Explorer to use this feature. Visto also has an Events Directory, which automatically adds preselected events like trade shows or movie release dates to your calendar.

Share a Business Calendar

► Not only do you need to keep track of your own schedule, but sometimes coworkers need to know where you are as well. **Yahoo! Calendar** (<http://calendar.yahoo.com>) is one of the best tools to use if you want to make your calendar public. Just click on the Options link and then the Calendar Sharing link. Then check the box that reads "Allow others to view this Calendar." Below that is the URL others should use to access your calendar. Even if you set your calendar to be public, Yahoo! lets you select certain events to be private. Yahoo!'s calendar is slick, with a big daily, weekly, monthly, or yearly calendar frame alongside a smaller to-do list frame.

Share a Personal Calendar

► Planning a wedding? Need to know where to get together for the game? Setting up a shared calendar could be the answer. With **Jump!** (www.jump.com) you just set up a group; everyone in it can view your calendar and add events. When an event is added to the group calendar, it automatically appears on your personal calendar. Extended families can keep track of events with the calendar at **MyFamily.com** (www.myfamily.com). With it, you can view calendar events and the corresponding family-news items simultaneously. **eFridge** (www.efridge.com) and the similar **MyTime** (www.mytime.com) let you choose whether others can view or edit your calendar.



Just use tabs to switch between Visto's day, week, and month views. To subscribe to Visto "Events," click on the events edit button.

schedule a meeting with **PlanetAll's** calendar (www.planetall.com), you choose which individuals or groups you want to invite and whether you want to send an e-mail to those invitees alerting them to the meeting. **PC**

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Image Scaling and Enhancement function that delivers crisp images at all resolutions.

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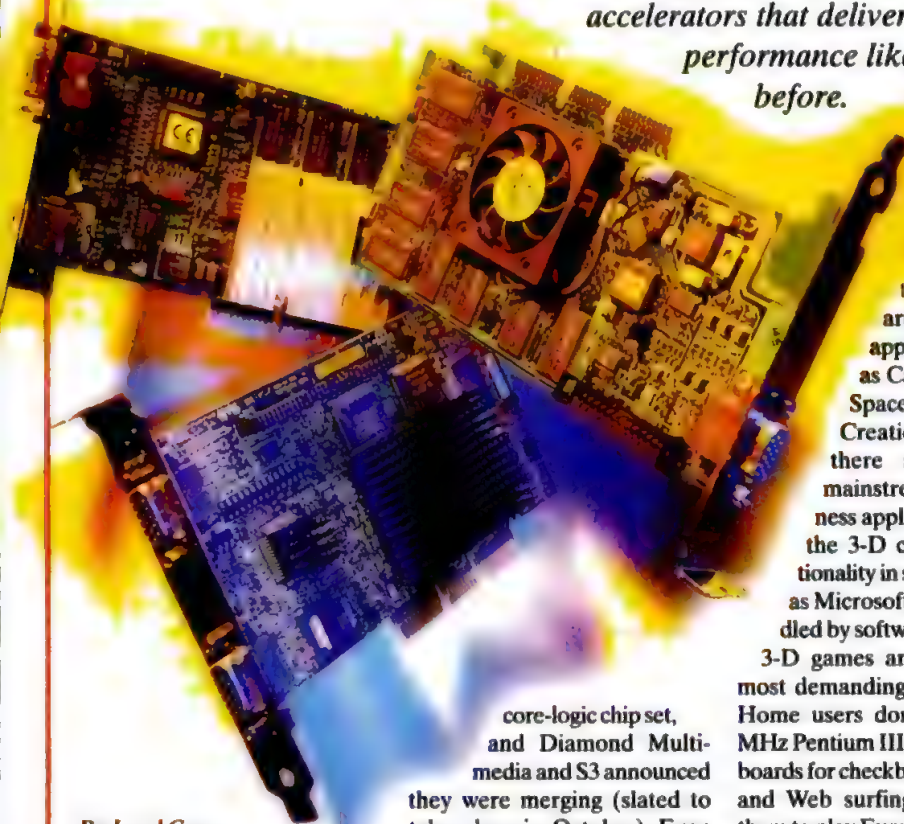
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3-D Graphics Boards

We take a close look at six new graphics accelerators that deliver 3-D performance like never before.



By Loyd Case

The business of selling retail graphics accelerators has undergone a sea change. Not so long ago, a huge number of independent graphics chip suppliers were trying to sell their wares to various board companies (such as Diamond Multimedia and STB Systems) that in turn would enhance the generally mediocre reference drivers, add better control panels, bundle some software, and sell the boards. There were vertically integrated companies, such as ATI and Matrox, but they competed as equals with the independent board makers.

For the most part, that's no longer true. In the past year, 3dfx acquired STB, Intel added graphics functionality to its 810

core-logic chip set, and Diamond Multimedia and S3 announced they were merging (slated to take place in October). Even 3Dlabs dipped a toe in the water by offering boards for sale directly to end users. When the smoke cleared, only one independent supplier of high-performance graphics chips remained for the mainstream PC market—nVidia.

The other change was the massive shift toward graphics chips with high-performance, 3-D-rendering capabilities. This new generation of chips, epitomized by nVidia's first TNT chip, offered fine image quality and performance. Now, even the lowliest, sub-\$500 PC has some 3-D functionality.

The Game Is Afoot

There's a simple reason for the existence of high-performance rendering engines on PCs: 3-D

games. Although there are other 3-D applications, such as Caligari's TrueSpace and MetaCreations' Bryce, there are no real mainstream 3-D business applications. Even the 3-D charting functionality in such programs as Microsoft Excel is handled by software.

3-D games are among the most demanding applications. Home users don't need 500-MHz Pentium IIIs with fast 3-D boards for checkbook balancing and Web surfing. They need them to play European Air War, MechWarrior 3, and Unreal.

Most of the boards we tested support 32-bit 3-D rendering. There is some controversy over whether 32-bit rendering actually looks better than 16-bit. Part of the problem is that most games still use 16-bit textures.

The trend is toward blending multiple textures together to achieve certain effects; using 16-bit textures in multiple-pass blending can result in quantization errors that adversely affect image quality. Hence, future games will use texture maps created and shipped in 32-bit color (actually 24-bit, plus an 8-bit alpha channel).

3-D boards aren't useless for business applications, though. As we discovered, the current generation of graphics boards

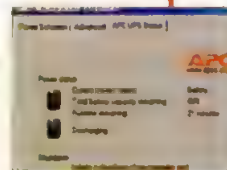
NOTE THIS:

With Post-it Software Notes 2.0 Office Edition, you can leave virtual sticky notes for your colleagues. *Page 64.*



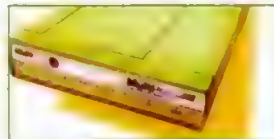
SOMETHING TO FALL BACK ON:

The APC Back-UPS Pro 500 offers a high degree of protection for your hardware and software. *Page 71.*



MODEMS, PLURAL:

The MultiTech Multi-Modem USB makes installing multiple modems a breeze. *Page 76.*



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FIRST LOOKS

also delivers superb 2-D performance. Even the slowest of them can handle complex business desktop chores.

In the future, applications such as 3-D visualization will become a part of data warehousing. Also, as the Web integrates into business life, 3-D graphics will make their way into various Web applications. Microsoft is investigating the feasibility of 3-D user interfaces for operating systems. But for now, the primary application for 3-D boards is still entertainment.

What We Tested

For this roundup, we tested five graphics boards representing five major 3-D graphics chips. Of the five, three support a stunning 32MB of local memory, and all offer advanced 3-D acceleration capabilities. The ATI All-in-Wonder 128 (\$190), Creative 3D Blaster Savage4 (\$90), Diamond Viper V770 Ultra (\$200), and 3dfx Voodoo3 3000 AGP (\$150) were bought from retail stores; we purchased the Matrox Millennium G400 (\$180) online. (All prices are street prices.) We also looked at the new 3DLabs Permedia3 Create! board (see the sidebar on page 44) but cover it separately, as its target audience is different.

We tested with ZD WinStone 99, Business Graphics WinMark 99, and 3D WinMark 99. But since gaming is the chief appli-

cation for 3-D acceleration, we also tested with 3DGameGauge 2.0 (www.3dgamegauge.com). Since this test is based on nine shipping game titles, we were able to get a good idea of how the boards perform across a wide variety of 3-D games in both Direct3D and OpenGL. All tests were performed using drivers obtained from the Web, not out of the box, to ensure that we used the most updated drivers available.

Holding Patterns

All of these current-generation products handle only two key pieces of the 3-D graphics pipeline: triangle setup and rendering. The two early stages of the pipeline, transform and lighting (T&L), are still handled by the host CPU.

That's likely to change later this year. nVidia has already announced that it would have T&L acceleration in one of its parts sometime in 1999. For applications to benefit, T&L acceleration must be substantially faster than any CPU performing the same function. If any company pulls it off, then we may see games and other applications with far greater triangle counts—and hence, greater visual realism.

But all of the boards here perform very credibly in today's demanding game environment, and they're no slouches at run-

ning business graphics, either. Not all perform equally well at higher resolutions, but they're superior to the boards available a year ago.

Graphics chip technology is moving forward at an astonishing clip. Some people may be tempted to wait for the next great thing, but if you need faster 3-D performance today, then these products fill the bill.

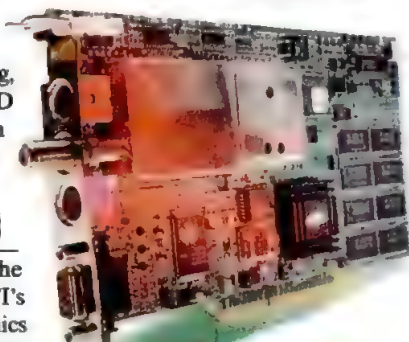
ATI All-in-Wonder 128

This board represents the third generation of ATI's "convergence" graphics board. The ATI All-in-Wonder 128 (\$190 street) delivers a strong, sophisticated set of video features, though its performance lagged behind several of the other boards.

Like earlier versions, the All-in-Wonder 128 combines a current-generation graphics accelerator, a TV tuner, and both input and output for TV signals. In place of the multihead cable in earlier products is a small, purple breakout box for the various connections. Also new is on-the-fly MPEG-2 compression capability. This is performed mostly in software, though the Rage 128 has circuitry that assists in the compression process.

The All-in-Wonder 128 is currently available in a 16MB

version. A 32MB version with the ATI Rage Theater chip will be available later in the year. The slick TV-tuner software uses a home-theater-system metaphor. All the software elements are



ATI All-in-Wonder 128

Street price: \$190.

ATI Technologies Inc.,

Toronto;

905-882-2600

www.ati.com

cleanly integrated into a single front end.

ATI has added some helpful usability features to its TV software. For example, you can click on the channel button on the virtual remote control or simply use the plus and minus keys on the keyboard to change the channel.

DVD playback quality is better than that of most software DVD players. There's less of a performance hit because of motion compensation and iDCT (Inverse Discrete Cosine Transform) support in hardware, which aids the MPEG-2 decompression process. TV or MPEG-2 capture at resolutions above 320-by-240 require a fast Pentium II or III CPU for best quality.

The board's performance in both 2-D and 3-D landed toward the lower end of the scale, though still above that of the 3D Blaster. But the unique feature set of the All-in-Wonder 128 makes it compelling for those who crave sophisticated video features but want minimal compromises in graphics performance.

SUMMARY OF FEATURES

Graphics Boards

PC MAGAZINE
EDITOR'S CHOICE

	ATI All-in-Wonder 128	Creative 3D Blaster Savage4	Diamond Viper V770 Ultra	Matrox Millennium G400	3dfx Voodoo3 3000 AGP
■ YES □ NO					
Street price	\$190	\$90	\$200	\$180	\$150
32MB RAM support	□	■	■	■	□
32-bit rendering	■	■	■	■	□
32-bit Z-buffer	■	■	■ ⁽¹⁾	■ ⁽²⁾	□
AGP support	2X, AGP texturing	2X, AGP texturing	4X (AGP 2.0), AGP texturing	2X, AGP texturing	2X
API support	Direct3D, OpenGL	Direct3D, OpenGL	Direct3D, OpenGL	Direct3D, OpenGL	Direct3D, OpenGL, Glide
Dual pixel pipelines	■	■	■	■	■
Other output	TV-out	None	None	Dual monitor or TV-out	TV-out
RAMDAC speed	250 MHz	300 MHz	300 MHz	300 MHz	350 MHz

(1) 32-bit Z-buffer is always on when the color depth is 32 bits. (2) This board does not support 32-bit Z-buffer using OpenGL without an upcoming patch.

Creative 3D Blaster Savage4

At a street price of \$90 for a 32MB board, there must be a catch, right? Not really. The Savage4 chip on the Creative 3D Blaster Savage4 clocks in at 110 MHz (slower than the Voodoo3 and TNT2 chips); the memory cost to support this chip clock is low, so the board's cost is lower than that of any of the other boards we tested. On the other hand, its performance on all our tests wasn't as strong as that of most of the competition. On the 3D WinMark test at 1,024-by-768 by 32-bit resolution, compared with the Editors' Choice Diamond board, the Creative board was 37 percent slower.

On the 3D GameGauge test, it was 40 percent slower.



Creative 3D Blaster Savage4

Street price: \$90.
Creative Labs Inc.,
Milpitas, CA;
800-998-5227
www.creative.com

The 3D Blaster uses the S3 Savage4 graphics chip, which has some interesting features that don't always show up on performance tests. For example, the Savage4 can do trilinear filtering with almost no performance hit. But the 3D WinMark test doesn't gauge trilinear filtering performance, so no benefit shows up on that test.

The biggest feature of the Savage4 also goes untested: the use of S3TC (S3 Texture Compression). Very few shipping games support S3TC today, but a slew of them with S3TC support

will be shipping later in the year. S3TC yields about a 6:1 compression ratio for most textures and works best on static, pregenerated textures. Most texture maps in today's games are 256 by 256 pixels or smaller.

Texture compression lets game developers use larger, more detailed textures without adding to memory. We've seen early builds of Unreal Tournament with high-resolution compressed textures, and the visual quality is stunning—with no performance hit.

The 3D Blaster ships with two color-matching tools from Sonnetech. As noted earlier, the board's scores were low in most cases. But because of the higher resolutions used on our tests, it wasn't apparent that performance picks up sharply at 800-by-600 or lower. The OpenGL ICD (Installable Client Driver) is also surprisingly robust. When you consider that the 3D Blaster offers better performance than any of the previous generation of products and factor in the low cost, the board begins to look a lot better.

Diamond Viper V770 Ultra



The Diamond Viper V770 Ultra (\$200 street) is based on the nVidia TNT2 Ultra graphics controller. Our Editors' Choice in this roundup, the V770 Ultra offers excellent 3-D and good 2-D performance, which combined with a robust set of features make the board ideal for both gamers and business users.

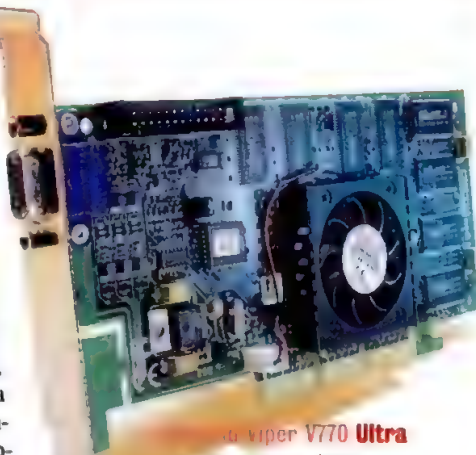
The TNT2 is a respin of nVidia's original TNT controller, moving from a 0.35-micron to a 0.25-micron manufacturing process. While prepping the chip for the die shrink, nVidia streamlined the 3-D pipeline, built in support for

AGP 4X (AGP 2.0), and increased the maximum possible video memory to 32MB.

Like many of the newer graphics chips, the TNT2 Ultra supports an asynchronous memory clock. This means that the chip and memory clock rates can be different. Because of the nature of most currently shipping 3-D game titles, clocking memory higher than the core (graphics chip) clock rate can give a big boost to fill rate. This translates into faster frames per second and smoother motion for game play.

The chip is also capable of rendering in 32-bit color throughout the 3-D pipeline, including final output. But 32-bit color has a significant impact on performance and memory.

In a trend that's become pop-



Diamond Viper V770 Ultra
Street price: \$200.

Diamond Multimedia Systems Inc.,
San Jose, CA;
800-486-5846
www.diamondmm.com

ular with many TNT2 Ultra board makers, Diamond has supplied a software tool that lets you increase the clock speed of the chip and video memory beyond the default specifications. To facilitate this, the V770 Ultra has "active cooling"—a euphemism for a small fan embedded in the heat sink that's attached to the TNT2 chip. Any success you have in increasing the clock rate of the V770 Ultra depends on the particular chip

Editors' Choice

• Diamond Viper V770 Ultra



Although a bit higher priced than the other graphics boards here, at \$200 street, the Diamond Viper

V770 Ultra provides a combination of great performance and robust features that make it a terrific choice for both hard-core gamers and business users. The V770 Ultra offers more flexibility than the other boards with an extensive set of controls, and it includes a huge bundle of software. The board scored at or near the top on all our tests, and it renders in 32-bit color throughout the 3-D pipeline. All these features combine to make this the board to beat.

If you're on the prowl for a bargain, however, you should take a look at the graphics board to which we award an honorable mention—the 3dfx Voodoo3 3000 AGP. This 16-bit board basically tracked the performance of the V770 Ultra on all but the 32-bit 3-D benchmark tests. With a street price of \$150 and a great gaming software bundle, the Voodoo3 3000 is a wonderful value.

on the board and the environment inside your PC (the added heat of clocking the chip higher may increase the internal temperature of the system to unacceptable levels).

Unlike the original TNT product, the Diamond Viper 550, the V770 Ultra doesn't have TV-out. There's an extensive software bundle included, including Portola System's Fremont SE (a business visualization tool), Zoran's software DVD player, and a pair of games.

The performance of the V770 Ultra was at or near the top of all of our tests. Interestingly, as soon as the color depth was boosted to 32-bit on our 3D WinMark test, the V770 Ultra fell behind the Millennium G400. The board's 3DGameGauge performance was essentially tied with the that of the Voodoo3 3000.

The V770 Ultra is the most expensive board in the bunch. But its performance, features, and software bundle all make the board a fabulous buy for performance-conscious users who have their feet planted in both the business and gaming worlds.

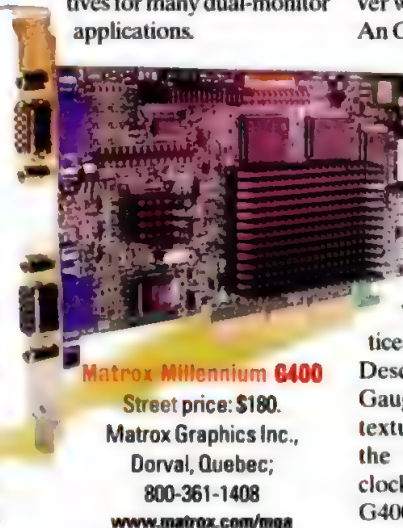
Matrox Millennium G400

The MGA-G400 chip is Matrox's newest graphics accelerator. Internal data is moved on a 256-bit data bus. Although Matrox doesn't report clock rates, the specified fill rate of 250 megapixels suggests a 125-MHz graphics chip clock. The Millennium G400, at \$180 (street), is a very intriguing choice for business users who may occasionally boot up a copy of European Air War.

This latest Millennium board supports several unique features. The first is environmental *bump mapping*, a way of simulating a 3-D look by applying a *bump map*, or texture map, to a surface texture. The bump map simulates directional lighting and creates an illusion of depth in a rough surface. Though the technique is currently used sparingly in games, environmental bump mapping can result in some very dramatic effects.

Also interesting is Matrox's dual-head feature. The board has twin VGA connectors, and each can be connected to a PC

monitor; the lower one can be connected to a TV with a supplied cable adapter. Each monitor can have different refresh rates and resolutions, which presents very flexible alternatives for many dual-monitor applications.



Where the Matrox board falls a bit short is in OpenGL support. Matrox was very late to the party with an OpenGL driver for its earlier G200 chip: In fact, a final OpenGL driver for the G200 shipped after the G400 hardware was available. Though the current ICD is OpenGL

1.1-compliant, its performance in such OpenGL games as Half-Life lags behind that of the TNT2 Ultra or Voodoo3. If fact, if an OpenGL application requests a 32-bit Z-buffer, the driver we tested cannot provide it. An OpenGL patch will be available soon on Matrox's Web site to address this issue.

2-D performance was excellent, and Direct3D performance was reasonably good across the board. Matrox did very well on our 32-bit 3D WinBench tests. But we noticed heavy artifacts during the Descent3 demo in 3DGameGauge 2.0, especially when new textures were introduced into the scene. There's a higher-clock-rate version of the G400—the G400Max—but it was not available in time for testing.

The Millennium G400 lies between the two performance leaders in price. But the dual-head capabilities, bump mapping, and excellent 2-D and good 3-D performance make the Matrox board a very appealing buy.

3Dlabs Permedia3 Create!

Another graphics board that's new to the scene is the Permedia3 Create! from 3Dlabs (\$220 street). But the Create! isn't a board for gamers like the others in our roundup—it's proposed to be an entry-level solution for content creators such as Web designers and creative professionals. 3Dlabs' robust OpenGL drivers should ably handle these more professional applications that don't demand high fill rates, as games do.

The Permedia3 chip itself had an unusually long gestation period at 3Dlabs. Initially slated for release early last fall, the chip's debut kept getting pushed back. Along the way, it picked up support for 32MB of video memory, but some of the performance expectations were necessarily scaled back.

The Permedia3 chip uses a unique demand-paged virtual-texturing scheme, which uses the AGP bus in combination with intelligent virtual memory algorithms to retrieve texture data rapidly in 4K blocks from system memory. This aids in real-time preview when doing high-resolution 3-D modeling and animation. The Permedia3 also supports bump mapping and can do triple blending of textures in a single cycle.

Although content creators should be willing to pay the premium for some of the advanced features of this board, it's really not for general business or home users. Game performance for the board was disappointing compared with the other boards in our roundup, though 2-D performance was on a par with the rest of the group. The Create!'s average 3D GameGauge score for all nine game demos was 24.9, 43 percent lower than the leading score. The Graphics WinMark score at 1,024-by-768 with true color was 169, slightly below average. Business Winstone performance was nearly identical for all the boards. On the 3D WinMark tests, the board trailed the leading score on the 16-bit tests by 42 percent at 1,024-by-768 and by 48 percent at 1,280-by-1,024. It also came in fourth on the two 32-bit 3D WinMark tests. (We did not test OpenGL performance for professional applications, however.)

If you use 3-D CAD or modeling applications and can't afford the higher-priced professional boards, then the Create! deserves a close look.

3Dlabs Permedia3 Create! Street price: \$220. 3Dlabs Inc., Sunnyvale, CA; 800-464-3348; www.3dlabs.com.

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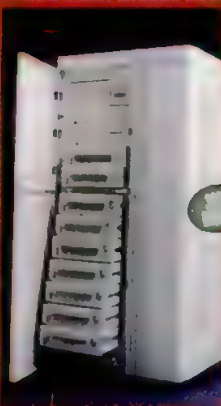
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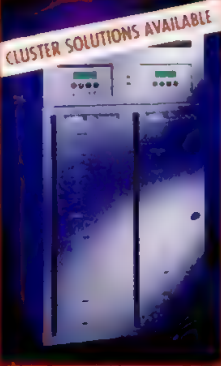
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- Power Supply Status
- Cooling Fan Status
- Visual and Audible Alarm

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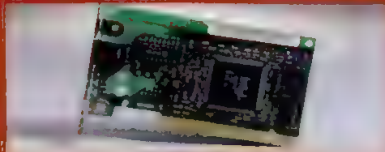
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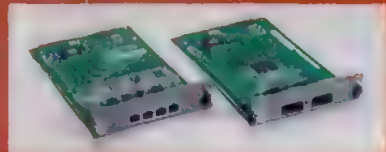
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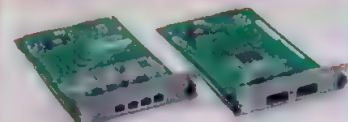
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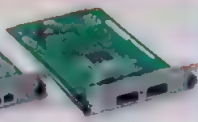
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PERFORMANCE TESTS



We ran all performance tests on Dell XPS T500 Pentium III/500 systems with Microsoft Windows 98. In addition to running ZD Business Winstone 99, Business Graphics WinMark 99, and 3D WinBench 99 at various settings, we worked with *Computer Gaming World* (one of our sister publications) to set up and run 3D GameGauge 2.0. This test suite runs individual demos of nine popular games, each of which taxes different parts of the graphics subsystem as well as the CPU. The Average Score is an overall mean derived from the average frame rate recorded for each game. To run 3D GameGauge properly, we set the graph-

ics driver so that it didn't wait for vertical refresh. For our testing, we used a popular graphics utility called PowerStrip Version 2.51.05 from EnTech Taiwan (www.entechtaiwan.com), which let us disable Vsync in those graphics boards that didn't let us change Vsync in their drivers. We ran all 3D GameGauge tests at 1,024-by-768, 16-bit color depth. Most of the games were run with Direct3D, except for Quake II and Half-Life, which used OpenGL. The 3dfx Voodoo3 3000 AGP used the 3dfx OpenGL mini-driver in both instances.

We bought the graphics boards at retail or online and downloaded the latest Web driver for each board. We

also spot-checked Business Graphics WinMark 99 and 3D WinMark 99 performance using the driver that came in the box. Since we believe most users would download the latest drivers, we tested 3D GameGauge with the Web driver only. We found that the ATI, 3dfx, and 3DLabs (for details on 3DLabs, see the sidebar on page 44) box drivers were the same revisions as those posted on the Web. We didn't notice any performance differences on our 2-D tests between the two sets of drivers, but there were some differences in 3D WinMark scores. Go to the online version of this story at www.firstlooks.com for details.—Analysis written by Laura Cox

ZD BENCHMARK TESTS

High scores are best.

Bold type denotes first place.

PC denotes Editors' Choice.

	Graphics memory	Graphics chip set	ZD Business Graphics WinMark 99 1,024-by-768, true color	ZD Business Winstone 99 1,024-by-768, true color	1,280-by-1,024, true color	ZD 3D WinMark 99 1,024-by-768, 16 bits	1,280-by-1,024, 16 bits	1,024-by-768, 32 bits	1,280-by-1,024, 32 bits
ATI All-in-Wonder 128	16MB	Rage 128	162	24.3	23.8	585	367	415	N/A
Creative 3D Blaster Savage4	32MB	Savage4	139	23.8	22.3	651	366	468	257
PC Diamond Viper V770 Ultra	32MB	TNT2	181	24.3	24.3	1,010	683	744	424
Matrox Millennium G400	32MB	MGA-G400	203	24.5	24.2	965	648	770	484
3dfx Voodoo3 3000 AGP	16MB	Voodoo3	188	24.4	23.1	957	604	N/A	N/A

N/A—Not applicable. The product could not perform this test.

3D GAMEGAUGE 2.0*

Frames per second	Average Score	Battlezone II	Descent 3	Expendable	Half-Life	Jane's WW2 Fighters	Madden 99	PowerSlide	Quake II Crusher	Unreal
ATI All-in-Wonder 128	25.9	19.5	21.4	13.5	22.1	24.3	39.0	44.6	27.3	21.0
Creative 3D Blaster Savage4	25.8	19.0	8.5	19.2	29.1	16.8	32.0	57.3	26.2	24.1
PC Diamond Viper V770 Ultra	43.3	29.5	41.4	48.8	29.6	28.2	44.0	82.8	41.1	43.9
Matrox Millennium G400	37.2	29.0	33.9	40.5	20.5	27.9	43.0	73.4	35.7	31.1
3dfx Voodoo3 3000 AGP	43.8	24.0	38.5	42.8	33.8	28.6	37.0	101.7	37.7	48.2

* We ran all the 3D GameGauge tests at 1,024-by-768, 16-bit color.

3dfx Voodoo3 3000 AGP

The 3dfx Voodoo3 3000 AGP melds a strong 2-D core with much of the technology originally developed for the Voodoo2 3-D-only board. So unlike Voodoo2s, the Voodoo3 boards represent a complete solution. At \$150 (street), the Voodoo3 3000 is a great choice for price-conscious shoppers; it earns an honorable mention.

Other than the ability to run at higher resolutions in 3-D, the 3-D behavior of Voodoo3 is much like that of Voodoo2. For example, if you run a nonmultitexture Direct3D game, the second pixel pipeline in the Voodoo3 goes unused—just like that of the Voodoo2. Despite this seeming handicap, the Voodoo3 3000 performed extremely well on 3D-

GameGauge; most of the games in GameGauge are multitexture games, which is the trend.

The 16MB memory limitation might seem like a handicap. Since the Voodoo3 3000 doesn't support 32-bit 3-D output to the frame buffer, it's not as big an issue as it sounds—and 16MB is more than adequate for most 2-D applications.

The other key issue with the Voodoo3 is its support for 3dfx's proprietary Glide 3-D API. Glide was 3dfx's solution for developers before Direct3D shipped from Microsoft. It had a wide following for several years in the developer community, but almost no one is developing exclusively for Glide any more. Still, Glide support is handy

in some legacy titles.

Some users have reported heat problems with the Voodoo3 3000. There's an enormous heat sink on the Voodoo3 chip, and the surface of the chip can get very hot. That's no problem

with good cooling in the case, but it is worrisome.

The performance of the Voodoo3 3000 essentially tracked that of the V770 Ultra (except for the 32-bit 3-D tests, which it couldn't run). The board was slower on a few of our tests and faster on others.

The model we reviewed comes with a very strong gaming software bundle, including a version of Epic Game's Unreal, a coupon for Unreal Tournament (not shipping at the time of the review), Need for Speed III, a reduced version of Descent 3, and a coupon for a software DVD player. Combined with the bargain price, the 3dfx Voodoo3 3000 is an excellent value for those who want performance and compatibility. **PC**



3dfx Voodoo3 3000 AGP

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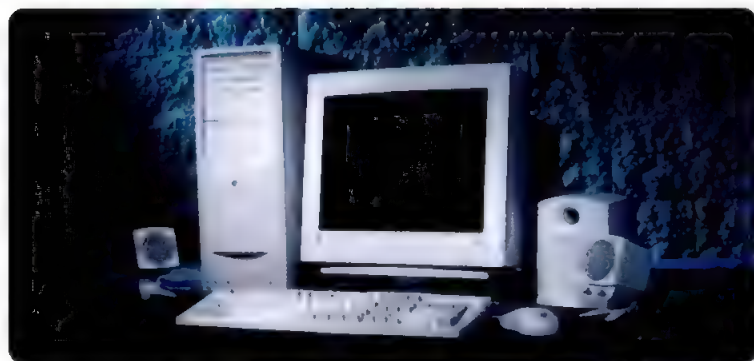
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Speedy Silicon Successors

We look at a new Intel Pentium III/600 PC from Compaq and a Celeron/500 PC from HP.

By Cade Metz

Having delayed the introduction of the chip code-named Coppermine—the first x86 CPU to be manufactured on a 0.18-micron process, a means of producing more efficient silicon technology—Intel has instead announced two new chips based on its 0.25-micron process, the current standard. These processors—the 600-MHz Pentium III and the 500-MHz

Celeron—the Pentium III/600 outperformed its 550-MHz sibling by roughly 4 percent under the Winstone 99 benchmark test program and close to 9 percent under the CPUmark 99 test. The Winstone score of the Prosignia Desktop 330 reviewed here was less than 1 percent higher than the average score in our recent roundup of 550-MHz Pentium III machines (June 8, 1999), but it significantly outperformed that roundup's Prosignia Desktop 330, a machine of comparable design.

Previously available at up to 466 MHz, Celeron is Intel's low-cost desktop CPU and uses the same core as both the Pentium II and III. Unlike the Pentium III—which sits on a palm-size strip of substrate with a separate, half-speed L2 cache—Celeron uses an on-board, full-speed L2 cache, which runs clock for clock with the CPU.

This cache is a quarter the size of the Pentium III's—128K rather than 512K—but what it lacks in size, it almost makes up for in speed. The 500-MHz Celeron scored only 7 percent lower under the Winstone 99 benchmark test program than the 500-MHz Pentium III—but only 3 percent higher than the Celeron/466. Using a low-cost Intel 810 chip set—rather than the Intel 440BX chip set used for our CPU overview—the Celeron/500-based HP Brio BA400 fails to take advantage of this potential performance boost.

Though the Brio BA400 scored almost as well as our CPU overview's Celeron/500 system under CPUmark 99, it scored 20 percent lower under the Winstone program, which is graphics-dependent. The Brio BA400 was also unable to run

our 3D WinMark 99 test at a color depth higher than 16 bits.

Of course, the Brio BA400—a sub-\$1,500 machine—is not meant for high-end 3-D applications. Like the Prosignia unit here, it's meant for office applications and business-related Internet tools.

Compaq Prosignia Desktop 330

An Editors' Choice winner in our inaugural Pentium III roundup in our issue of March 23, 1999, the Compaq Prosignia Desktop 330 is in many ways the model small-business PC. Fast and reasonably priced, it offers a tractable chassis, extensive help documentation, desktop management interface (DMI), and Internet services for your own e-commerce site.

Few mainstream PCs are better equipped than the Prosignia Desktop 330. With 128MB of memory, a Diamond Viper graphics board, and a 22GB, 7,200-rpm hard disk, it performed just as well under the 3D WinMark test as under the Winstone test. It's also equipped with a 6X DVD drive and a SoundBlaster Live! audio board—though audio performance was average and DVD playback was rather poor.

Such an array of hardware typically inhabits so-called "power user" PCs, but this Prosignia unit is undoubtedly a small-business machine. It includes both Ethernet board and modem, and affords access to Compaq's Online Services, a set of tools that allow you—among other things—to access your machine remotely and back up important files. Compaq also provides a copy of Microsoft Office 2000, a three-year parts/one-year on-site labor warranty, and a 19-inch monitor.

HP Brio BA400

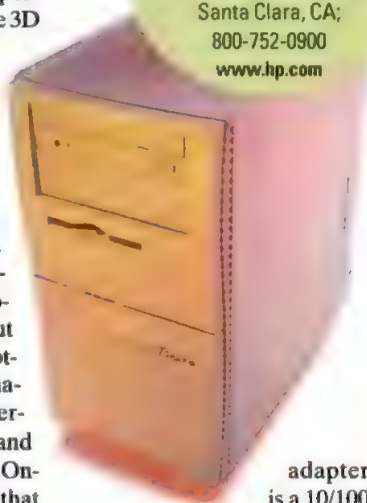
Less than half the cost of the Prosignia, the HP Brio BA400 isn't nearly as impressive, but

the unit is more compact and equally well equipped for e-commerce. The Brio houses 64MB of memory, a CD-ROM drive, and a 13.5GB hard disk and connects to a 17-inch monitor. Included software is a bit more impressive: Hewlett-Packard bundles Microsoft Office 2000 as well as the Brio Internet Center, through which you can easily connect to the Internet, create Web sites, and develop an e-commerce presence.

This diminutive mini-tower is one of first systems on the market to eschew ISA slots and rely entirely on the faster PCI bus. Its modem, a 56-Kbps USB model, doesn't even need a PCI slot. With graphics and audio integrated on the motherboard, the system's only removable

HP
Brio BA400

Street price: \$1,330.
Hewlett-Packard Co.,
Santa Clara, CA;
800-752-0900
www.hp.com



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is a 10/100
Ethernet

board, ready for connection to your office LAN.

Now offering a three-year warranty (with one year of on-site labor) and round-the-clock phone support, HP has also made servicing the system easy. Although the Brio BA400 performed poorly under Winstone, it's likely to suit the needs of small businesses with small budgets.



Compaq
Prosignia
Desktop 330

Direct price: \$2,699.
Compaq Computer Corp.,
Houston;
800-345-1518
www.compaq.com

Celeron—are merely faster versions of existing CPUs, but additional speed is always welcome in the ever-evolving desktop PC market.

Here, we review two of the first commercial machines to use these processors: the Compaq Prosignia Desktop 330 (\$2,699 direct), based on the Pentium III/600, and the HP Brio BA400 (\$1,330 street), built around the Celeron/500. Both are designed for small businesses, offering high-speed networking and several tools to facilitate e-commerce.

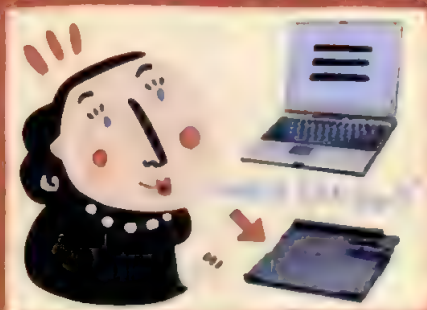
During testing for an upcoming overview of the CPU market (in our issue of September 21, 1999)—which involved benchmark testing of different chips in similar high-end sys-



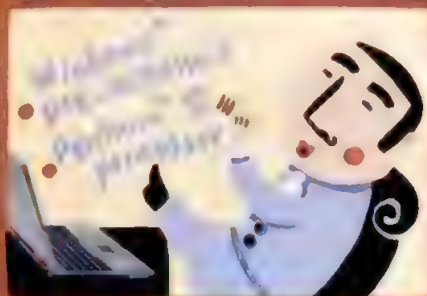
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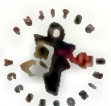
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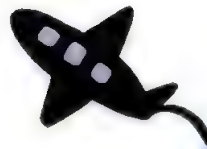
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www.ViewSonic.com

Graphics with Flash

Compared with Macromedia Flash 4, other Web graphics creation tools must now aim higher.

By Luisa Simone

While the World Wide Web Consortium is hashing out the specification for a native vector-image format on the Web, Macromedia Flash continues to establish itself as the de facto format for interactive vector Web graphics. The release of Flash 4 (\$299 direct) increases Flash's lead by streamlining the authoring process and delivering nearly universal playback.

Macromedia Flash 4 emphasizes interactivity with a slew of new, more sophisticated behaviors. The program can now evaluate conditions, in order to set up true branching interfaces. Developers can manipulate objects at runtime by altering properties such as position, scale, and transparency, in response to user input.

Flash 4 also supports text-input fields, so developers can gather information from end users. Macromedia expects developers to send data to a Web server (typically running CGI scripts).

haviors and a dedicated Expressions Editor. But creating complex actions feels more like program development than like graphics development. We also think managing these complex actions within the restrictions of a frame-based timeline will prove cumbersome.

Web Publishing

Publishing your Flash creations to the Web is easier than ever. The new Publish command can generate a multitude of files in different formats (including Flash 3 and 4, GIF, JPEG, and QuickTime) with one click of a mouse button. And instead of expecting you to hand-code the

terface if the Flash movie can not be displayed.

Interface Improvements

Macromedia has tweaked the Flash interface in dozens of ways. The end result is that commonly used features are easier to access, and the program looks and performs more like other Macromedia products.

Flash 4 also provides a number of dockable, tabbed Inspector palettes that let you manage objects, scenes, and frames more easily. And the Library lets you organize, sort, and count instances of the assets in a movie. Seemingly small enhancements—such as the ability to manipulate keyframes directly in the timeline, edit a symbol within the context of the design, and

of sound on the Web, Flash 4 can export MP3 compressed audio but does not import it. The only serious shortcoming we found in Flash 4 is that it won't support Developers Studio Extensions for Macromedia Generator (a graphics server that can generate and update graphics dynamically on the Web) until this fall.

Flash Partners

From a developer's point of view, playback in a wide variety of browsers is important. A recent survey conducted by the independent research firm of King, Brown & Partners (funded by Macromedia) indicates that the Flash browser plug-in is available and active on more than 100 million computers,

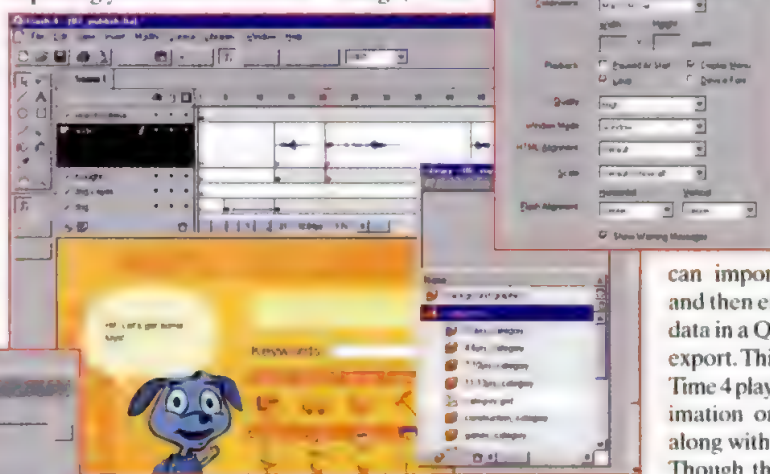
thanks to a host of strategic partnerships with AOL, Microsoft, Netscape, and others.

The big news is that Apple's new QuickTime 4 player will offer built-in Flash support—no plug-in necessary. Flash 4

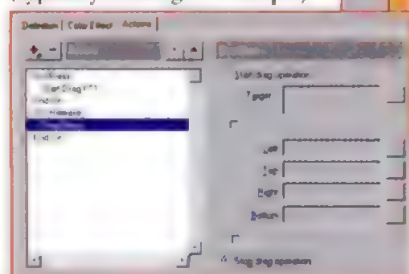
can import QuickTime video and then embed the Flash SWF data in a QuickTime track upon export. This enables the QuickTime 4 player to stream Flash animation or interface elements along with video over the Web. Though this works, our testing revealed that QuickTime 4 only supports Flash 3 functions.

The new features in Macromedia Flash 4 represent an evolutionary—not revolutionary—upgrade. And yet they give the program the power to generate dynamic interfaces for sophisticated Web applications.

Macromedia Flash 4. Direct price: \$299 (download, \$269); upgrade: \$129 (download, \$99). Requires: 16MB RAM (24MB RAM for NT); 20MB hard disk space; Microsoft Windows 95, 98, or NT 4.0 or later. Macromedia Inc., San Francisco; 415-252-2000; www.macromedia.com.



BETTER GUI: Interface improvements to Flash 4 include resizable tracks in the timeline, which make it easier to sync audio to keyframes, and new organizational tools in the Library. The Publish command (above, right) lets you generate an HTML wrapper for a Flash movie.



COOL CODE: The Actions tab in the Properties box lets you create behaviors such as the code to make a movie draggable.

But Flash 4 can perform simple mathematical operations, concatenate strings, and handle variables—all essential logical underpinnings for interactive interface design or game development.

Macromedia attempts to make actions easy to structure by providing a pop-up list of be-

HTML wrapper, Flash 4 can automatically create the HTML code that instructs a browser to display the Flash movie.

Like other Macromedia products (notably Dreamweaver and Fireworks), Flash's HTML output is based on either a predefined or custom template. We particularly liked one predefined template that generates HTML to redirect users to a static GIF or JPEG image of the in-

enlarge an audio track to sync sound with keyframe events—deliver big productivity boosts.

Flash 4 doesn't offer new kinds of animation, but it makes creating animation effects—specifically, Motion Tweens—easier. The program can convert shapes into symbols when performing the tween and can create new keyframes when you manipulate the tweened symbol on the stage.

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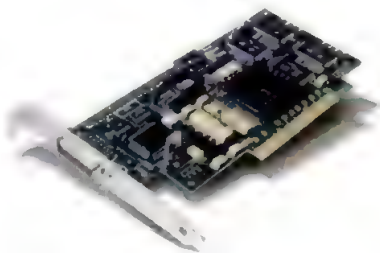
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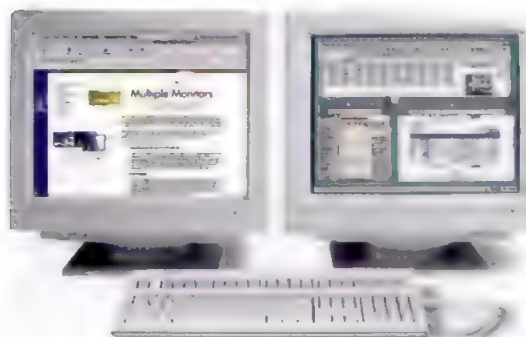


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The Closest Yet to Film

We review 2-megapixel digital cameras from Olympus, Ricoh, Sony, and Toshiba.

By Daniel Grotta and Sally Wiener Grotta

For years, digital camera manufacturers have struggled to reach parity with film cameras. Now the wait is finally over. *PC Magazine* put four of the newest generation of 2-megapixel digital cameras through their paces, and we're happy to report that they all deliver image quality that's almost indistinguishable from that of film.

The digital cameras we tested are all stylish, compact, metal-skinned, CCD-based devices, each with an auto-focus lens—the \$1,000 (street) Olympus C-2000 ZOOM and the \$700 (street) Ricoh RDC-5000 also have zoom lenses. At \$700 (street), the Ricoh model and the Toshiba PDR-M4 are the least expensive in our roundup. Except for the Sony Cyber-shot DSC-F55 (\$900 street), the cameras have both optical and LCD viewfinders and ship with 8MB of memory (the Sony unit has 4MB).

These digital cameras are as easy to operate as point-and-shoot film cameras—when they're in default mode. Operation becomes more complicated

when you switch to other modes or activate special features.

Booting up 2-megapixel digital cameras takes between 3 and 7 seconds, depending on the model. The fastest digital camera we tested, the C-2000 ZOOM, requires about 3 seconds to recycle, and the slowest, the Cyber-shot, has a delay of 6.6 seconds. All the digital cameras in this roundup are versatile, fun to use, and capable of capturing excellent images. But the RDC-5000 wins our Editors' Choice award for two reasons: image quality (in default mode) and value. Its zoom lens and video in/out capability make the Ricoh unit the best buy.

Olympus C-2000 ZOOM

Novices will welcome the Olympus C-2000 ZOOM's ability to shoot in automatic default mode, and serious amateur photographers will appreciate the pro-like manual controls. You can shoot in aperture mode or shutter-priority mode. To adjust to difficult lighting conditions, you can specify the appropriate white balance and quickly change the C-2000's ISO equivalent. This is one of the few



OLYMPUS C-2000 ZOOM: It may look like a point-and-shoot film camera, but inside, the C-2000 is a powerhouse of versatility.

entry-level digital cameras designed to sync with an auxiliary flash or studio strobes.

Turning the camera on correctly—and preventing accidental turnoffs—takes getting used to, because the on/off button is located where the shutter release is on many cameras. The lens bezel can accommodate auxiliary lenses and filters, and the diopter eyepiece in the optical viewfinder can be focused for wearers of glasses.

Navigating through the C-2000's modes and menus is intuitive and fast, though some of the icons can be confusing. There's a barely noticeable delay between pressing the shutter and taking the picture, but recycle time is just average.

We especially liked panoramic mode, which displays guidelines on the LCD viewfinder for correct rotation and then stitches the image together in the camera. Unfortunately, you can't view the image in the camera once it's

stitched. The average size of a fine-mode image is 1.2MB, which decompresses to 5.5MB.

The C-2000's image quality is a notch above that of 1-megapixel digital cameras. Our test print exhibited lots of data in the midtones, without blowing out the highlights. Colors are slightly muted, and skin tones carry a very light magenta cast.

As the most expensive and versatile digital camera in this roundup, the C-2000 will appeal to business users who require a high degree of hands-on control, good-quality images, and the ability to create panoramas easily. **Olympus C-2000 ZOOM.** Street price: \$1,000. Olympus America, Melville, NY; 800-347-4027; www.olympus.com/digital.

Ricoh RDC-5000



Ricoh is known for oddly configured, feature-heavy digital cameras that almost require an engineering degree to master. The powerful Ricoh RDC-5000 breaks the mold: It's easy to use, even with its many features.

The RDC-5000 is larger than the average digital camera. It has a mechanical on/off slide that doubles as a protective shutter over the LCD. The lens is similarly shuttered and opens when it's ready to shoot. Its 2.3-megapixel CCD is the densest in our roundup.

The SmartMedia compartment, power, video, and USB

SUMMARY OF FEATURES

2-Megapixel Digital Cameras

	Olympus C-2000 ZOOM	Ricoh RDC-5000	Sony Cyber-shot DSC-F55	Toshiba PDR-M4
Street price	\$1,000	\$700	\$900	\$700
Best resolution	1,600 x 1,200	1,792 x 1,200	1,600 x 1,200	1,600 x 1,200
Number of megapixels	2.10	2.30	2.10	2.14
Weight	15.0 ounces	15.0 ounces	10.2 ounces	10.0 ounces
Included memory	8MB SmartMedia	8MB internal	4MB Memory Stick	8MB SmartMedia
Lens	f2.0, 3X zoom	f8.0, 2.3X zoom	f2.8, 6.85 mm	f3.2, 9.2 mm
Viewfinders included	Optical, 1.8" LCD	Optical, 1.8" LCD	2.0" LCD	Optical, 1.8" LCD
MPEG video capability	☐	☐	☒	☐
Direct connection to printer	☒	☐	☐	☐
Ports	Serial	Serial, USB	Serial	Serial, USB
Shutter speeds (seconds)	1/2–1/800	1–1/500	1/60–1/1,000	1/4–1/1,000

ports are also protected. This is the first digital camera we've seen in which the LCD can be adjusted either in firmware or by turning a thumbwheel on the bottom of camera. Everything is conveniently located, and the menu is in clear English.

You can program the RDC-5000 for unattended time-lapse photography, shooting a single frame every 30 seconds to 3 hours, an appealing feature. And manual focus works well (down to 1.6-inch close-ups). For low-light, nonflash candid shots, you can slow the shutter speed while boosting the ISO equivalency (sensitivity to light).

The RDC-5000 is the only digital camera we tested that features video-in and video-out. The camera can therefore be used as a real-time hand-held monitor for a camcorder, a VCR, and other devices.

You'll find some quirky elements. Although the camera has a SmartMedia slot, it ships with 8MB of built-in memory instead of a removable memory card. The RDC-5000's display mode has many options, including an enhanced zoom, but there's no rotation command in the camera for viewing vertical pictures.

Our test image was sharp and well exposed. Colors were not overly saturated, and skin tones were warm and pleasing. We found no noticeable clipping in the highlights and shadows. Images were clearly superior to those of the other cameras.

Image files



RICOH RDC-5000: Image quality and value make this camera our Editors' Choice.



SONY CYBER-SHOT DCS-F55:

Each button and knob is not where you'd expect, because of the camera's small size.

shot in fine mode averaged 1.6MB, and decompressed images expanded to 6.16MB

A low price, great pictures, interesting features, and ease of use all make the RDC-2000 a must-see device for both families and businesses.

Ricoh RDC-5000. Street price: \$700. Ricoh PC Peripherals Business Unit, West Caldwell, NJ; 800-742-6410; www.ricoh.com.

Sony Cyber-shot DSC-R55

The Sony Cyber-shot DSC-R55 incorporates many technical innovations that put other manufacturers in catch-up mode. Instead of an anonymous camcorder-type lens, it has a Carl Zeiss Distagon lens. The camera's built-in microphone can not only annotate each frame, but in conjunction with its

MPEG capability, it can record up to 2 minutes, 40 seconds of full-motion video and audio on a 4MB Memory Stick.

To save battery power, the LCD is a hybrid that combines transmissive and reflective illumination. This allows the backlight to be turned off

on sunny days. The camera also shoots in black and white, sepia, negative, and solarize modes, and images are so sharp that photographed text can be successfully run through OCR

software. There is no optical zoom, but the digital zoom is quick and easy to operate.

At first glance, the test image looked sharper than the other cameras' images. But a closer inspection showed that the image was nearly 1.5 f-stops underexposed, with heightened contrast. Colors were muted, though the whites stood out without blowing out. All in all, the Cyber-shot delivers quality images, albeit on the dark side. Image files take up 1.45MB when captured and decompress to 5.5MB.



PDR-M4's 2.1-megapixel CCD produces an impressive 1.66MB file in fine mode that decompresses to 5.5MB.

Shooting the PDR-M4 is only slightly more challenging than using a box camera. Turning the large dial on top of the camera activates it and opens the lens cover. The control buttons are well laid out.

Although the unit is designed to be used primarily as a point-and-shoot digital camera, the PDR-M4 has various pro-like features. For instance, it's the only entry-level digital camera with a bulb setting, for time exposures up to 8 seconds. You also have the choice of applying blur or sharpen filters or switching to black-and-white mode for photographing text that can later be used with OCR software.

Despite the camera's pedigree, image quality fell slightly below the level of that of the other cameras in this roundup. Our test



TOSHIBA PDR-M4: First-time users will have no difficulty navigating through the menu and understanding the control panel.

The Cyber-shot is a useful business tool, but it's also fun to operate. This is an excellent device for on-the-go users who want shirt-pocket convenience with cutting-edge technology and are willing to pay a slight premium to get it.

Sony Cyber-shot DSC-R55. Street price: \$800. Sony Electronics, Park Ridge, NJ; 800-222-7669; www.sony.com.

Toshiba PDR-M4

The Toshiba PDR-M4 combines an art deco look with ease of use, at an affordable price. Despite its diminutive size, the

image looked washed out, and the white highlights were indistinct. Skin tone quality was good, but because the image was overexposed by half an f-stop, colors lacked snap.

The Toshiba PDR-M4 is an amateur-oriented digital camera capable of producing good-quality enlargements and blowups, with a minimum of fuss, at a relatively low price.

Toshiba PDR-M4. Street price: \$700. Toshiba Imaging Systems Division, Irvine, CA; 800-288-1354; www.dsc.toshiba.com.

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A Snazzy All-in-One PC

Packard Bell NEC takes a page out of the iMac playbook with its new Z1 computer.

By Carol Venezia

Apple iMacs prove that computers don't need to be beige to be well-integrated, powerful machines. Later this summer, Windows PC loyalists can have attractive, all-in-one systems as well, with the Packard Bell NEC Z1. At about \$2,500 (street), the Z1's space-age look just may be worth the price of admission.

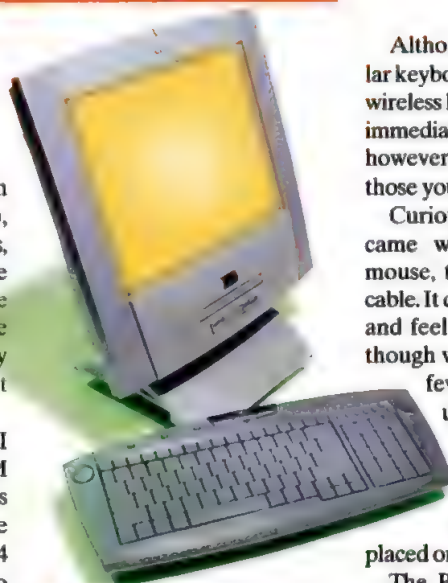
Look quickly and you might think that the steel-gray Z1 is just a 15-inch LCD panel with integrated speakers. But look a bit closer and you'll see floppy disk and DVD drives below the display. When you turn the display around, you'll see from the built-in ports and connectors that there's a PC in there.

The Z1 is a bit larger than the Gateway Profile XL LCD PC

(see our First Looks review, "An Affordable LCD PC," August), mainly because of its speakers, which are located below the LCD panel. The unit—when the LCD is tipped to a comfortable viewing angle—measures 18 by 16 by 12 inches (HWD); it weighs about 24 pounds.

A 450-MHz Pentium III processor, with 96MB of RAM and an 8GB hard disk, powers the machine. Graphics come courtesy of S3's new Savage 4 engine with 8MB of memory, so you can easily run the XGA display at a 32-bit color depth and have enough left over for Doom.

On the left of the unit are ports for a V.90 modem, and for headphone, microphone, and line-in jacks. On the right, you'll find an RJ-45 connector for the system's integrated Ethernet, two PC



SELF-CONTAINED: The Z1 is a functional, powerful PC in a stylish, space-age package.

Card slots, and keyboard and mouse connectors. The standard parallel port is on the back, and a port marked "NEC Peripheral Connector" in the base lets you easily transfer hard disk data.

Although you can use a regular keyboard, the Z1 ships with a wireless keyboard, which wasn't immediately comfortable to use, however; the keys are more like those you'd find on a notebook.

Curiously, our test machine came with a beige wheelie mouse, tethered via the USB cable. It detracted from the look and feel of the machine, even though we welcomed it after a few minutes of trying to use the wireless keyboard's integrated mouse (two large, round buttons for pointing and clicking, placed on either side at the top).

The Packard Bell NEC Z1 isn't for everyone: Budget-conscious buyers should definitely look elsewhere. But if form matters just as much as function to you, check out the Z1.

Packard Bell NEC Z1. Street price: As tested, \$2,500. Packard Bell NEC Inc., Sacramento, CA; 888-863-2669; www.nec-z1.com.

A Fix for Y2K—and Beyond

Symantec updates and improves Norton 2000 Retail Edition, its Y2K utility, with Version 2.0.

By Ben Z. Gottesman

Many year 2000 products will be one-hit wonders: A vendor builds a program to address some aspect of the century rollover problem, keeps it on the market through the new year, and lets it fade away slowly. But Symantec Corp. is bucking this trend, with its recently released Norton 2000 Retail Edition 2.0.

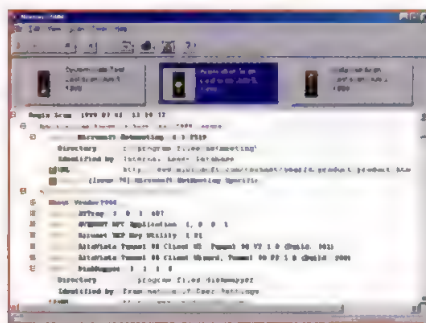
Like the original program, Version 2.0 examines your system clocks, applications, and data files, alerting you to potential problems. New to this version is Fix Assistant, which can automatically fix problems in Microsoft Excel spreadsheets or guide you through fixing them. And Norton 2000 now examines spreadsheets and databases embedded in compressed files.

We found the program easy to use, although Norton 2000 could do more to report test results in layman's terms.

Upon startup, the Norton 2000 wizard walks you through each of its tests. The System Date test ensures that the system date will roll over properly at the end of the year and on a few important dates thereafter. On one system, the real-time clock failed the test, so Norton 2000 advised us to install the Resident System Date Fix device driver—but we had to go back to the CD to find the program.

Next, the wizard scans your applications and highlights those that have problems, those in compliance, and those that it

doesn't know about. For the last group, you are linked to Electronic Data System Corp.'s Vendor 2000 Web site (www.vendor2000.com), which maintains an extensive list of applications and solutions. For programs with known problems, Norton 2000 links you to the application vendors' Web sites.



▲ QUICK FIX: The Application Scanner shows you which applications have problems and where to go for help.

Although we found the application scans helpful, they can also be confusing. We often had to dig on a vendor's site to find Y2K information. And Norton

2000 frequently gave programs unfamiliar version numbers.

The final step is Data File Scan, which examines spreadsheets and databases. As in Version 1.0, Version 2.0 makes a copy of problem spreadsheets and color-codes cells with potential errors.

Symantec has also released Norton 2000 2.0 Corporate Edition (\$5,400 list for 100 users). This version lets IS managers better assess a company's Y2K status.

Despite a few rough edges, Norton 2000 provides a valuable and inexpensive suite of tools to help you make sure your systems are ready for next year and beyond.

Norton 2000 2.0 Retail Edition. Street price: \$50 (free upgrade from Version 1.0). Requires: 32MB RAM; 25MB hard disk space; Microsoft Windows 95, 98, or NT. Symantec Corp., Cupertino, CA; 800-441-7234; www.symantec.com.

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PC-Free E-Mail

The Cidco MailStation provides easy access to Internet e-mail for those without a computer.

By Bruce and Marge Brown

If you're looking for a practical solution for family members or business associates who are currently out of the e-mail loop, consider the Cidco MailStation, a standalone message appliance (\$100 street, with an annual \$100 service fee for unlimited usage). Anyone who wants to bypass purchasing and installing a computer just for e-mail access will love the ease of setup and operation of the MailStation. First-time users can send and receive electronic messages within minutes, and the MailStation offers a spell-checker, an address book, an events calendar, outbound faxing, a printer connection, a calculator, and five POP3 e-mail accounts per device (\$3 per month for each add-on account).

The MailStation's integrated 33.6-Kbps modem connects with Cidco's e-mail ISP via local access numbers in 44 states and the District of Columbia. It comes configured with a personal account-access number and e-mail address and is ready to operate using three double-A alkaline batteries (included) or a power connection (AC adapter included) and a phone line connection (82-inch cable included). With the MailStation, you can send and receive e-mail to and from any Internet e-mail address.

At a light 1.9 pounds and measuring 11.6 by 10.3 by 7.0 inches (HWD), the MailStation is ideally suited for portable message management. You can sit by the pool and compose e-mail to individuals or address groups for batch transmission, or you can permanently connect it to a phone line.

With one keystroke, you can toggle between two highly viewable fonts on the 2.3- by 6-inch LCD. A graphical interface, crisp

menus, and well-labeled function keys provide stress-free navigation. The 16.5-mm-pitch keyboard is comfortable and includes prominent keys for spell-checking, the main menu, and e-mail retrieval.

The MailStation reserves 384K of its 512K flash memory for e-mail and up to 1,000 contact records. If the batteries drain, the MailStation retains your data indefinitely in flash memory. You cannot open e-mail attachments on the MailStation, but a free PC mail account for attachment and long-message retrieval is provided for PC-literate users

at the company's Web site.

MailStation messages can be printed in e-mail format or in a more abbreviated letter format. The printer interface is limited to Canon ink jet series, Epson

Stylus, and HP DeskJet and LaserJet printers. A limitation deserving mention is that there is no address grouping for outbound faxes.

The Cidco MailStation does one thing very well: The device establishes nonthreatening e-mail access for new users. It's a terrific purchase for anyone who wants to communicate in cyberspace with a single-purpose device.

Cidco MailStation. Street price: \$100, plus \$100 annual service fee. Cidco Inc., Morgan Hill, CA; 800-718-1242; www.cidco.com.



▲ SMALL WONDER: The 1.9-pound Cidco MailStation is ideal for portable e-mail management.

Virtual Sticky Notes

3M's new Post-it® Software Notes 2.0 Office Edition lets you send sticky notes over a LAN.

By Barry Simon

A prototypical use of old technology in a new setting is attaching a sticky note to a coworker's monitor to make sure your message is received. With 3M's Post-it® Software Notes 2.0 Office Edition, you can send your coworker a virtual sticky note right over

a note. In addition, the program is Internet-aware in several ways, and you can make note templates for reuse.

The basic program lets you place colored notes on the desktop, inside any OLE-aware document, or on memo boards that can be shared across any network with TCP/IP support. You can

use text that can be formatted in color or with any supported Microsoft Windows font.

Now, you can also insert pictures into a note (but only in BMP format). Pictures can come with tool tips or even with an attached URL. Clicking on the picture directs your browser to that URL. URLs can also be clicked on as text in the note.

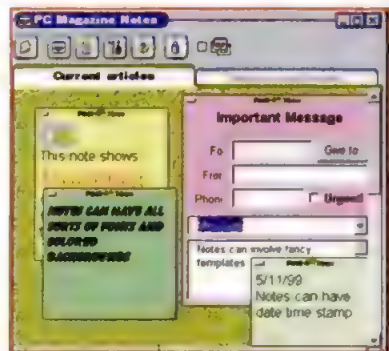
When several users on a network have the Office edition of Post-it Software Notes, anyone can send a note to the desktop of any other user.

You simply right-click and select the user to whom you'd like to send the note. The contents of a note can also be e-mailed to another user; Post-It Software Notes works with MAPI-compliant e-mail programs.

You can produce simple note templates with canned text and date, time, and user name. The program comes with one built-in template that has action buttons, drop-down menus, and fill-in fields. 3M promises additional templates in the future.

Although easy to use, the program has a few awkward aspects. Formatting text in a note is done via a single dialog; we wished for a toolbar. You can turn off the silly sound effects, but there seems to be no way to turn off annoying visual effects such as notes pirouetting to oblivion when you delete them. These are minor glitches in a product that's useful for organizing the scraps of information in your life.

Post-it® Software Notes 2.0 Office Edition. List price: \$24.95 (upgrade, \$14.95). Requires: 5.5MB hard disk space; Windows 95, 98, or NT 4.0. 3M Corp., St. Paul, MN; 800-328-6276; www.3M.com/psnotes.



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Analyze Your Data—Free

Seagate Analysis and Seagate Info 7 can help you make sense of your business data.

By Steve Rigney

Seagate Software believes that business data is ubiquitous and that the tools to analyze and report on that data should be free. In an effort to set this standard, the company has introduced two free business-intelligence tools, Seagate Analysis and Seagate Info 7. Analysis is available for download from Seagate's Web site, or you can request a CD that contains both programs.

Analysis, designed for single users, is a desktop utility that lets you look at data in a variety of ways and create your own reports. Info 7 is a network tool that gathers information from desktops running Analysis and other sources and lets multiple users share data and create reports.

In Analysis, you choose whether to create a new data source or experiment with the bundled sample reports. When creating your own data source, you can gather information from the Windows NT Event log, IBM DB2, Microsoft Exchange, and several other sources. After gathering data, you've given several methods for creating reports.

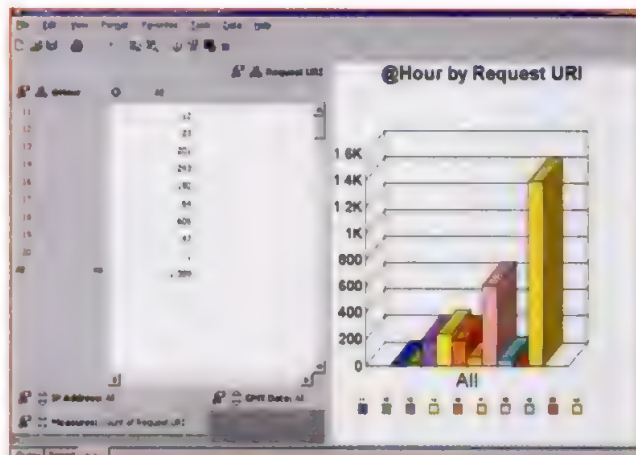
Data can be analyzed using basic ad hoc queries—the number of widgets sold last Tuesday, for example—or using the built-in OLAP (On-Line Analytical Process) cube navigation. OLAP is a type of database that lets you process queries and create multidimensional views of large data stores more efficiently than relational databases.

With the cube feature, you can look at data from different views in a worksheet format. This is useful for viewing multidimensional trends, such as the days of the week on which the most widgets were sold. Once the data has been gathered and the reports created, you can export the infor-

mation to an Excel spreadsheet for further manipulation.

Info 7 comes with a 50-user license and is designed as multi-user tool. It integrates all of Analysis's features and also lets you share data with multiple users on a network. You can view data using a proprietary Windows utility, such as Analysis, or via a browser or a Microsoft Outlook client.

Although both Analysis and Info 7 provide powerful queries and reports of detailed databases, you must have a strong grasp of how to create the reports to make the best use of the pro-



▲ CUBISM: The OLAP cube reports provide multidimensional views of data for performing trend analysis.

grams. One thing is certain, though: You can't beat the price. **Seagate Analysis and Seagate Info 7.** Price: Free CD or down-

load. Seagate Software Inc., a subsidiary of Seagate Technology Inc., Scotts Valley, CA; 800-877-2340; www.fetchseagate.com.

Palm IIIe Lights Up

Palm Computing produces the 3Com Palm IIIe for cost-conscious consumers.

By Bruce and Marge Brown

The newest connected organizer from Palm Computing is the 3Com Palm IIIe (\$230 street), a 2MB economy model intended for students and general consumers who are ready to try a PDA. The Palm IIIe is quite satisfactory for its intended market; it lacks only the greater storage (4MB),

Microsoft Outlook conduit, and internal expansion slot of the Palm IIIx (\$370 street), the corporate user model.

The most remarkable enhancement of the Palm IIIe over the soon-to-be-phased-out Palm III (\$250 street) is the inclusion of the reverse backlit LCD touch screen used with the Palm models IIIx, V, and VII, which makes the Palm IIIe usable in the dark. The Palm IIIe units have the same core PIM and HotSync software included in all current Palm models, as well as the IR port for PIM record and application beaming and the combination of the Graffiti character recognizer and virtual keyboard for data input.

The 5.8-ounce Palm IIIe measures 4.6 by 3.8

by 0.8 inches (HWD) and comes with a

HotSync cradle, two triple-A alkaline batteries, and a serial data cable. It has a flat gray case with

a flip cover and can use Palm OS 3.1 third-party applications as well as Palm III hardware accessories, such as the clip-on Palm modem (\$130 street) and the new PalmConnect USB kit (\$40 street). Departing from the executive look, Palm IIIe accessories include PalmGlove padded cases (\$30 street), available in six colors. The Palm IIIe stores 6,000 contacts and 3,000 appointments, along with approximately 3,000 to-do items, memos, and e-mail.

Palm Computing hits the mark with the 3Com Palm IIIe—a low-cost, highly legible monochrome organizer with sufficient memory to personalize its application suite. Families can improve organization with individualized Palm IIIe units and even a shared desktop computer for synchronization. For double duty, you can install a program to synchronize your Palm data with most popular office PIM and e-mail systems. The 3Com Palm IIIe is an excellent choice for a first-time organizer.

3Com Palm IIIe. Street price: \$230. Palm Computing Inc., a 3Com Company, Santa Clara, CA; 800-881-7256; www.palm.com.



MY FIRST PDA: The Palm IIIe is a great starter organizer.



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Meet You on the Web

Now you can easily set up free real-time meetings on the Web with WebEx Office.

By David Haskin

One of the many free business services that abounds on the World Wide Web, WebEx Office, from ActiveTouch, distinguishes itself with a unique mix of capabilities, enabling real-time meetings to discuss projects, mark up documents, and show presentations. In addition, WebEx Office provides private and public calendars, folders for exchanging files, and an address book for contacts. We found nothing about these basic capabilities that you can't find elsewhere on the Web, but no other site combines them with real-time meetings.

WebEx's meeting capabilities are similar to those found in Microsoft NetMeeting, although WebEx is easier to set up and can include multiple attendees. You initiate a WebEx meeting by clicking on a link after you've set up your private WebEx office. WebEx then downloads the required ActiveX control.

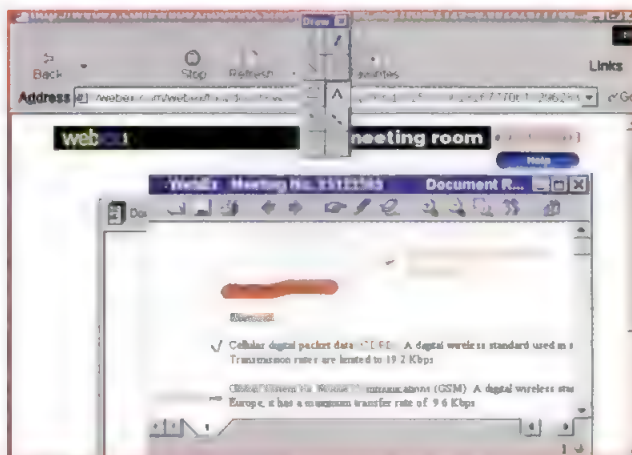
WebEx provides a unique serial number for your meeting, which other participants use to log in. Once a meeting is in session, separate applets can be used to conduct text chat sessions or show a PowerPoint presentation. You can also view Web sites as a group, and you can demonstrate applications installed on your PC.

The product's most thorough feature is the document mark-up applet. Before you use the applet, WebEx converts the locally stored file into a proprietary graphic format using a driver it installs on your PC. The image then appears in a WebEx window, and meeting members can use tools to mark up the document.

As with all free Web services, WebEx has limitations. No voice capabilities are offered, although ActiveTouch plans to add them,

and WebEx can't support more than 6 meeting participants at once. You can demonstrate an application to others, but you can't control others' applications. For that ability, along with SSL security during meetings and support for as many as 200 simultaneous meeting participants, you must purchase the advanced WebEx service, which is \$1,000 a month and roughly \$50 per seat.

WebEx also eschews collaborative capabilities that aren't in real time. For instance, it has no threaded discussions, e-mail, or ability to check documents in and out of WebEx's public fold-



▲ **ON YOUR MARK:** You can mark up documents in real time in meetings, one of WebEx's most useful capabilities.

ers for orderly editing by work-group members. Still, WebEx is simple to set up and provides meeting capabilities not found

elsewhere on the Web. **WebEx Office.** Price: Free. ActiveTouch Inc., Santa Clara, CA; 408-980-5200; <http://webex.com>.

PC Protection via USB

The APC Backup-UPS Pro 500 adds file protection and safe system shutdown to PC power protection.

By Bruce Brown

Competent power protection devices help protect your PC during brownouts, spikes, flickers, and total blackouts, but when power fails for an extended period, you can lose data from open files when the backup battery finally

sions to Windows 98 Power Management software.

Indented handholds on the side of the 9.4- by 5.0- by 7.9-inch (HWD), 15.4-pound Pro 500 make it easy to move, while its sloped top with four battery-backed and surge-protected outlets and three additional out-

lets—with surge protection only—are convenient to reach.

The 315-watt capacity unit uses a hot-swappable lead acid battery that fully charges in 6 to 8 hours and is rated to provide 8 to 19 minutes of runtime. Using a 166-MHz NEC PowerMate PC and a Gateway GP6-233 PC, the Pro 500 power-monitoring software reported runtime at 24 and 23 minutes, respectively, after we pulled the plug.

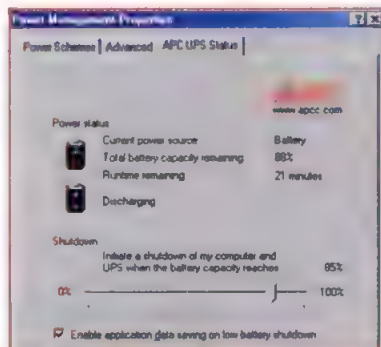
APC's software adds a tab to the Windows 98 Power Management Properties application, accessed via the Control Panel,

which displays the current power source and available runtime. You can select the level of battery power at which the system will turn off the computer.

Not all files can be secured with the Pro 500; current versions of Microsoft Office program files are safest. Three minutes are allotted for saving and closing files before the software turns off the system. A pop-up window displays system shutdown progress.

In testing, when the plug was pulled with Microsoft Office 97 Excel and Word files open, the system quickly saved the files, closed the applications, and powered down the computers, once the preset battery level was reached. We also tested with a variety of other common programs and didn't find any the APC software couldn't close safely.

If you leave your system running unattended, the APC Backup-UPS Pro 500 offers a high degree of protection for your hardware and software. **APC Backup-UPS Pro 500.** List price: \$299. Requires: Windows 98, USB port. American Power Conversion Corp., West Kingston, RI; 800-877-4080; www.apcc.com.



▲ **BALANCE OF POWER:** At a selected level of power, the Pro 500 saves files, closes programs, and turns off your PC.

fails. The APC Backup-UPS Pro 500 (\$299 list), from the American Power Conversion Corp., adds file protection and safe system shut-down via a USB connection and intelligent exten-



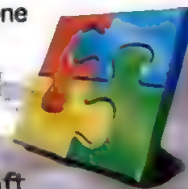
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Balance Your Web Farm

RadWare can provide reliability and redundancy to your Web server farm with its new WSD-Pro+.

By Jeffrey Witt

Though Web sites represent virtual worlds, there's still plenty of physical infrastructure behind these electronic presences. The RadWare WSD-Pro+ (\$15,280 list), belongs to a category of products referred to as *load balancers*, the unsung building blocks in the foundation of any Web server farm. The WSD-Pro+ distributes the flow of incoming traffic across servers, creates a redundancy scheme, and offers easy scalability.

► GOOD DIRECTIONS:

ConfigMaster lets you set parameters to direct users to specific servers.

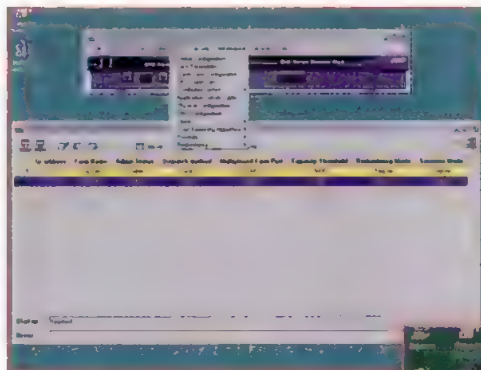
On our tests, we positioned the WSD-Pro+ in front of our two Windows NT servers running Microsoft's IIS Web Server and the same content. The WSD-Pro+ model we tested offers two Fast Ethernet ports for attaching the unit to Internet access routers and to a switch for connections to the servers. As the term *load balancer* implies, data packets or requests that arrive to your site are parceled out across your servers.

Though this allows for increased performance in terms of response time, it also means you can skip expensive hardware upgrades by scaling up your Web farm with additional machines. Since the WSD-Pro+ can represent content of multiple servers with a single virtual address, you have a cost-effective method of incrementally building your site. For large-scale sites looking for ultimate performance, RadWare claims a 445-Mbps throughput rate for HTTP traffic.

The WSD-Pro+ is easy to set up. Through a standard terminal connection, you assign an IP and

routing addresses, as well as additional identification information. The management utility then takes over configuration of the box.

The ConfigMaster software is a Java-based SNMP management tool that gives a graphical representation of the WSD-Pro+, showing real-time port status and offering pull-down menus for configuring and monitoring the device. The software can run in standalone mode or through a browser and stands out by making a compli-



cated process simple.

Adding or replacing servers doesn't require network or server reconfiguring, since the WSD-Pro+ uses a virtual IP address to talk to the server cluster. You have a choice of load-balancing methods for directing traffic. For Windows NT-only servers, a load-balancing algorithm is available based on Microsoft's built-in SNMP agent.

You can direct traffic to specific servers based on their processing power and define distribution thresholds. For narrowing requests even further, you can use the SuperFarm attribute, which lets you send users to specific servers that contain only certain file types.

All your site's information is kept secure via the access controls of RadWare's Facility for Access Control and Security

(FACS). The number of sessions a server accepts can be limited to avoid hacker attacks such as SYN Flood. As an additional security measure, the Network Address Translation (NAT) feature represents the server farm to the outside world with the single IP address of the WSD-Pro+.

In a world where a downed Web site is akin to a "Closed" sign on the door of your business, the WSD-Pro+ creates bulletproof fault tolerance. By continuously monitoring the servers, the WSD-Pro+ can automatically redirect users to available resources without interruption of service in the case of failure.

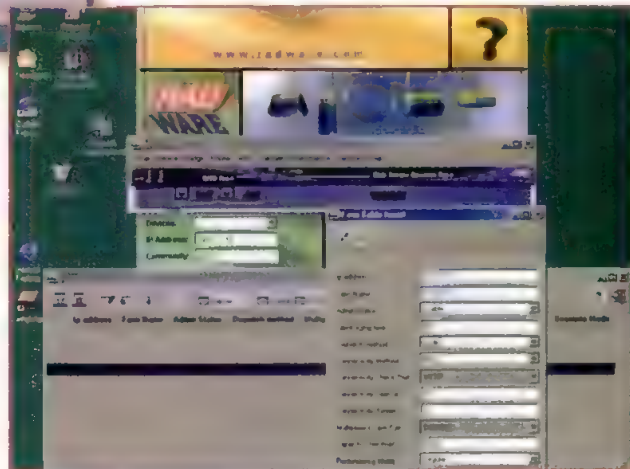
For ultimate protection, the WSD-Pro+ can even back itself up. We added a twin unit to see this feature in action. The two units use a technique referred to as *state mirroring* to update one another, allowing for

location in case of total loss of service.

In terms of management, ConfigMaster plugs into HP OpenView for Windows and provides SYSlog messages that a large variety of network management tools can interpret. From the ConfigMaster console, there are any number of graphically represented statistics. You can view Elements (general performance specifications, such as requests and responses) as well as application- or server-specific information.

As you collect data, you can easily display the information in graphs in real time or saved to file. Being able to monitor exactly what's going on with your server farm during peak loads is handy for determining the number of clients attached to different servers, so you can direct traffic to minimize connection failures.

The WSD-Pro+'s plug-in appliance approach doesn't disrupt your network layout and contains excellent management tools. Reasonably priced, the



▲ **MASTER MANAGEMENT:** You can run ConfigMaster as a standalone application or through any browser.

transparent failover. The units can run in tandem for optimum performance (as opposed to having one unit sitting idly in standby mode). For physical Web site redundancy, you can configure an agent to direct traffic to an entirely different

product gives ISP and large-site performance features and around-the-clock availability to anyone's Internet beachhead. **RadWare WSD-Pro+.** List price: \$15,280. RadWare Inc., Mahwah, NJ; 888-234-5763; www.radware.com.

Fix Windows NT Problems

The latest version of NOSadmin for Windows NT finds security flaws and helps you take action.

By Steve Rigney

Gathering information and creating reports on security settings, hardware, and software on all of your Microsoft Windows NT-based servers can take hours and use up a lot of valuable network bandwidth. Combine this with the time needed to correct the problems the reports uncover, and you're looking at a full-time job. The ability to gather information quickly and react to that information is what we like about the new version of BindView Development Corp.'s NOSadmin for Windows NT.

Version 6.1 can scan for up to 600 security flaws on your Windows NT servers, as well as gather information about each server's hardware, software, and configuration settings. All of this information is then made available to one of the 500 bundled reports.

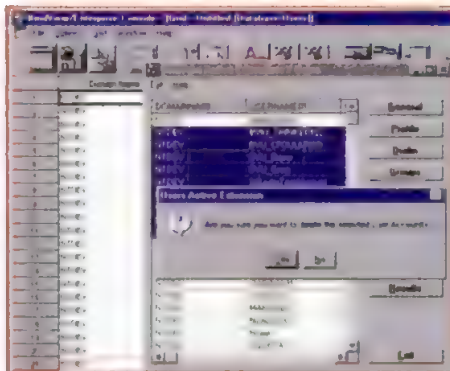
NOSadmin runs as a snap-in

module to BindView's Enterprise Management Console software. The package consists of Windows NT services that run on all of the managed servers, query engines, and a Windows-based console for tracking information and creating reports. The server software costs \$695 (list) per server, and the user licenses are around \$15 per managed user. A bulk rate for a license for 100 users with a single server goes for \$1,595.

ParaFlex is the name of BindView's scalable reporting architecture. ParaFlex relies on separate query engines built into Windows NT services. A large Windows NT domain will usually consist of a master NOSadmin query engine and multiple slaves.

The master engine in the domain breaks up each query task

and then sends each one to the slaves for processing. Each engine runs as a multithreaded process and sends the information back to the master, which submits it to the management console. This parallel tasking lets administrators spread the load among multiple servers.



▲ **FIND FAULT:** You can use NOSadmin to find all users on a network with aged accounts and then delete them.

The number of slaves you deploy is based on the number of servers in your domain and where they are located on the network. The engines gather information about the server's hardware, software, Registry, and user accounts.

Gathering information about your Windows NT servers is nothing new, but finding problems and then fixing them is. ActiveAdmin is the utility in NOSadmin that fixes problems found by the query engines. For example, we instructed NOSadmin to find every user in a domain that had an easy-to-guess password. We were then able to use ActiveAdmin to send an alert to those users, instructing them to change their passwords. ActiveAdmin can perform other tasks such as stopping and starting Windows NT services, making changes to Registry files, and updating login scripts.

Version 6.1 of NOSadmin for Windows NT is an excellent tool for administrators of large Windows NT-based networks.

NOSadmin for Windows NT Version 6.1. List price: For 100 users, \$1,595. BindView Development Corp., Houston; 800-749-8439; www.bindview.com.

More Modems, Less Hassle

The MultiTech MultiModem USB takes the mess out of installing multiple modems.

By Les Freed

Installing a multiport Windows NT Remote Access Server (RAS) solution can be an all-day exercise. Until now, installing several modems on an Windows NT server almost always required shutting down the server and opening the case; all too often IRQ or addressing conflicts were involved. The MultiTech MultiModem USB (\$1,399 list) installs in a few minutes, without so much as a reboot.

The MultiModem's smallish metal box contains four V.90 modems, each with its own set of front-panel LEDs and a rear-panel RJ-11 phone jack. The

rear panel also hosts a Type A and a Type B USB connector, which lets you stack several MultiModems with other USB devices on a single USB connection.

MultiTech provides driver software for Windows 95, 98, and NT 4.0 and later. Windows 95 and 98 users can use the MultiModem with Dial Up Networking or as a shared network fax modem. If your ISP supports multilink PPP over analog connections, you can combine the bandwidth from two or more modems.

The Windows NT drivers let the MultiModem operate as dial-in or dial-out modems with

Windows NT RAS. Each modem operates independently, and you can stack several MultiModem units on the same USB connection without installing additional driver software.

If you're considering the MultiModem or any other analog V.90 modem for dial-up RAS server use, an important point to remember is that a V.90 modem can deliver a 56K connection only when the host-side device is connected to a digital ISDN or T1 line. Our sample MultiModem delivered fast, 50-Kbps connections on outbound calls to our ISP; inbound calls are limited to 33,600 bps.



▲ **MORE THAN A MODEM:** The MultiModem looks like an external modem with a lot of LEDs.

The MultiTech MultiModem USB is backed by a two-year warranty and includes a large bundle of communications, fax, and Internet software on a CD-ROM.

MultiTech MultiModem USB. List price: \$1,399. MultiTech Systems, Mounds View, MN; 800-328-9717, 612-785-3500; www.multitech.com.

Relieve Your E-Mail Overload

The Mirapoint M1000 Internet can ease the e-mail strain for ISPs or corporations.

By Rob Schenk

The Mirapoint M1000 Internet (for unlimited users, \$27,250 list) is targeted at ISPs and large corporations looking to manage e-mail traffic more easily, without the overhead and technical expertise needed to maintain an Exchange or Notes infrastructure. The M1000 appliance is designed with a sole purpose in mind: to deliver reliable and robust POP3 and IMAP4 e-mail serving that doesn't take a guru to maintain. The server can be integrated into your existing network to off-load e-mail traffic from traditional file and print servers; it supports all the requisite mail standards, including IMAP4, LDAP, POP3, and SMTP.

The M1000 consists of a rack-mountable mail server chassis, a RAID Level 5 hard disk cage, and a universal power supply. Mirapoint has added redundant power supplies and fans, along with hot-swappable hard disks to help ensure that the M1000 stays up and running consistently. Management software is accessible via a Web browser, and an administrative Java applet is also included.

Big Job, Easy Installation

Installation was straightforward. Once we booted up the system and entered several network parameters using a numeric keypad interface, the server was up and running. To manage the M1000 fully, a Java-based applet needs to be installed on a Windows-based administrative machine.

This utility gives administrators full control over the M1000. Performance of the applet was a little sluggish on our tests, although we found its layout easy to navigate and logically organized. Administrators can create

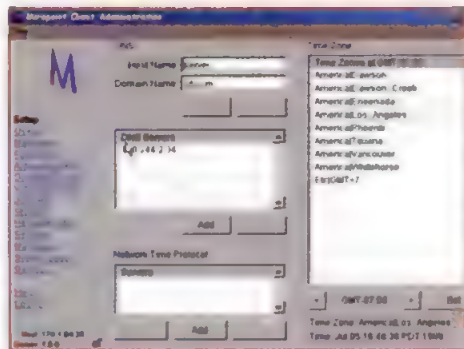
custom scripts or batch functions when they access the M1000 via a custom command-line interface. Also, ISPs can integrate provisioning and billing tools.

Simplified Management

The e-mail server management software (based on BSD Unix) is where the heart of the e-mail server resides. Here, we were able to add, delete, or modify new users, groups, and mailing lists quickly. We assigned mailbox quotas and storage limits on a per-user basis. Virtual domains can be created at this point as well, letting ISPs host e-mail accounts for multiple companies.

We also monitored vital system components such as the CPU fan, the temperature, and the voltage using the Java applet. Should a component fail or develop errors, administrators can choose to be alerted via e-mail or by pager.

To help decentralize basic administrative tasks, end users can



be granted the ability to change passwords, configure auto-replies, forward mail, or manipulate shared folders. Virtual domain administration can also be delegated if desired.

Our test M1000 came equipped with 384MB of ECC RAM, a 400-MHz Pentium II CPU, and a RAID Level 5 controller. The RAID chassis, which also includes redundant power



▲ **TAKE A LOAD OFF:** The Mirapoint M1000 Internet can help you lower technical-support costs.

supplies, housed three 9GB LVD-2 10,000 rpm hard disks, with another four slots available for additional storage. Our test unit had 14GB of usable storage. Two additional RAID controllers and disk cages can be added to the system.

Better Backup

The M1000 has built-in backup using Legato. Full or incremental backups can be specified. We liked that online backups can be performed and that mailboxes can be restored individually without affecting the system.

Mirapoint has expended some effort in terms of security. The company has modified the BSD kernel disabling ROOT

start running out of disk space, additional 9GB or 18GB disks (up to 216GB) can be added to your disk arrays. Smaller companies for which the M1000 is overkill might consider the its younger sibling, the M100. That unit supports up to 300 users and can store up to 72GB of data.

We saw some interesting results when performance testing the M1000 with the ZD Email Server Test Tool (ZD ESTT), our e-mail server benchmark stress test, which places increasingly difficult POP3 and SMTP loads upon the server, eventually getting far beyond what servers are likely to see in the real world. The server performed well enough, both in terms of response time and numbers of messages sent and received, until the heaviest segments of the test. Mirapoint engineers claim that with a few tweaks to balance the huge numbers of incoming POP3 and SMTP requests more evenly, the M1000 will perform well even under the heaviest ZD ESTT stress loads.

The Mirapoint M1000 is a solution for corporations or ISPs looking to lessen the e-mail strain on traditional servers or for those looking to lower technical-support costs. Though expensive, the M1000 provides reliable and robust e-mail serving capabilities.

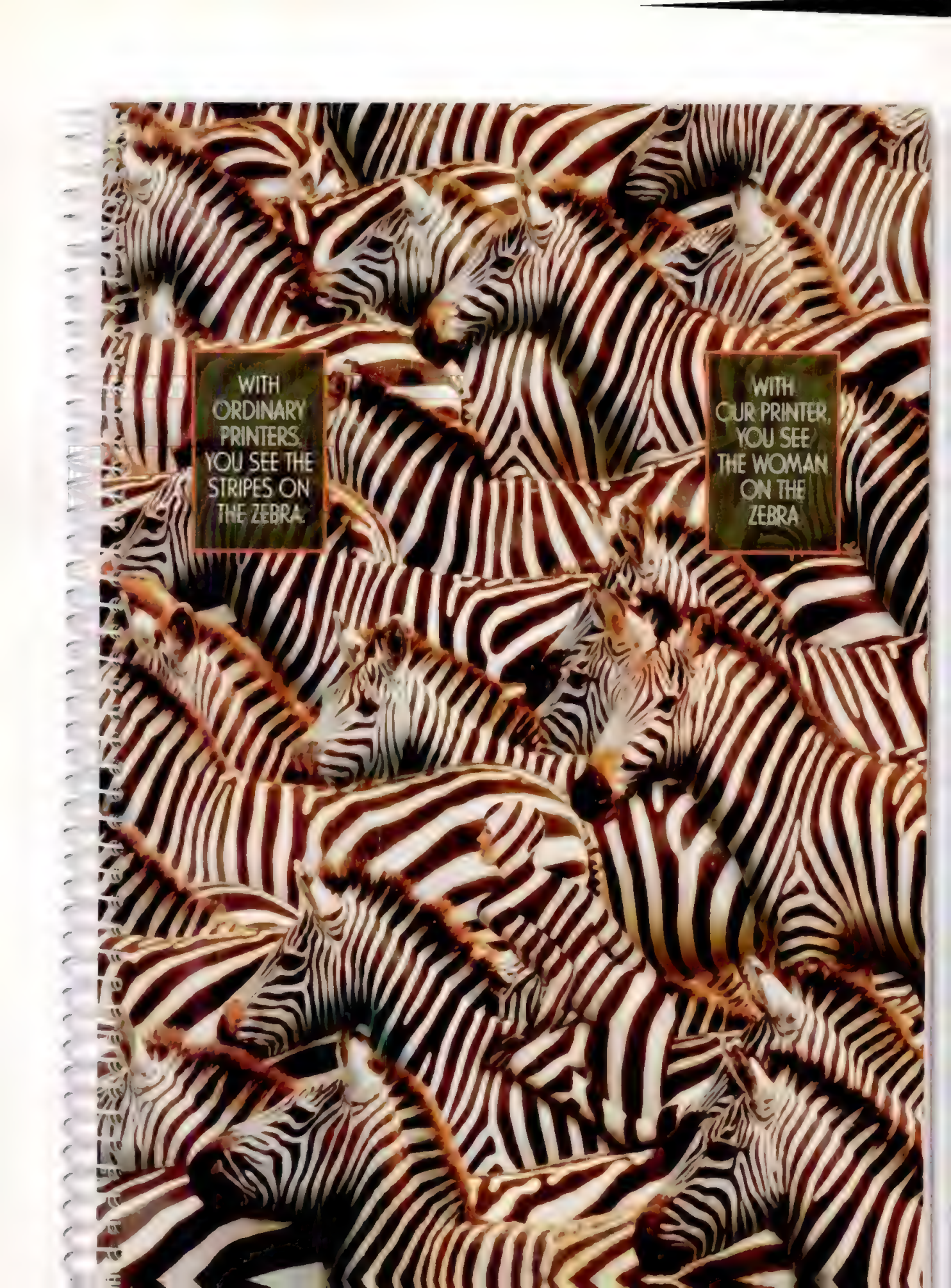
Mirapoint M1000 Internet. List price: For unlimited users, price starts at \$27,250. Mirapoint Inc., Cupertino, CA; 408-517-1300; www.mirapoint.com.

◀ **REMOTE CONTROL:** With a Java-based applet, administrators can remotely perform basic maintenance tasks on the M1000.

and system shell access. We were able to blacklist

spammers by domain name or IP address. Mail relaying is turned off by default but can be enabled if needed. For added security, administrators can stipulate that only trusted IP addresses are able to access the system.

According to Mirapoint, the M1000 is rated to support up to 150,000 POP3 users or 6,000 corporate users, depending on user environment. When you

A large herd of zebras is shown, with a woman's face superimposed on their stripes. The woman's face is visible in the upper right quadrant of the image, appearing as if it is part of the zebra's pattern. The zebras are standing in a field, and the overall image is a high-contrast, black and white photograph.

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THE ZEBRA.

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THE WOMAN
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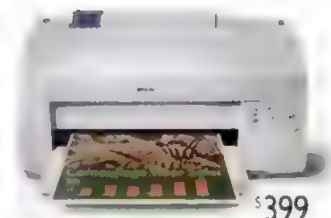
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ICQ: Would Less Be More?

By Jim Lynch

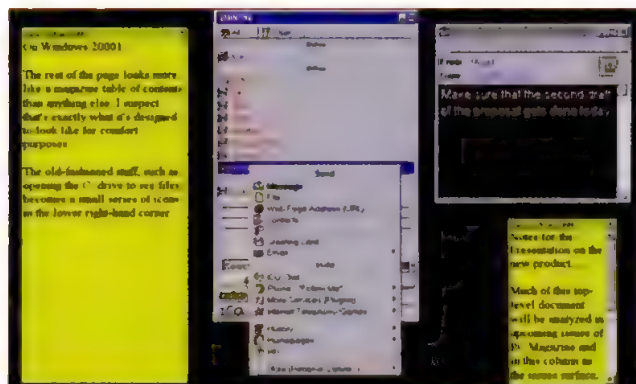
ICQ was one of the first instant messaging clients available on the Web and subsequently built a huge audience of early adopters who have been loyal to the product. But there has been a great deal of grumbling about the latest release, ICQ 99a, with many of our readers decrying the "AOL-ization" of ICQ. The larger size and comparatively slow loading speed of the new client were readers' greatest concerns; some readers even switched back to an older version of ICQ.

One of AOL's goals has been to turn ICQ into a desktop portal. The latest version goes a long way toward that goal by adding a Web search feature and other applications, including a to-do list and notes. Many

of our readers think that AOL's next step will be to add advertising directly to the client. They worry that this will make ICQ even more unwieldy.

We share the assessment that advertising is on its way to ICQ, but we can't blame AOL for wanting to capitalize on the many ICQ users. We can only hope the ads won't be so intrusive that they affect the program's usability.

Our readers weren't shy in expressing their opinions about AOL's influence on ICQ. One wrote that ICQ had "been pretty reliable for me, but there are just too many features now. There are so many preferences and settings it's starting to make Yahoo! Pager look good. If I'm going to chat with my friends,



why do I need to send greeting cards? I knew the people at AOL would screw it up once they got their hands on it."

So has ICQ finally hit "feature overload?" Our own experiences lead us to say no. We've found the new features useful enough to overlook any additional load time and stable enough to run reliably on a

PAGER OR PORTAL: ICQ 99a adds apps to chat.

number of different systems (some Windows 98-based and some Windows NT-based) on which we've used it. Our readers, for the most part, seem to prefer a chat pager that is mainly, well, a chat pager. Perhaps less is truly more.

Talking to the Web, Part III

By Alfred Poor

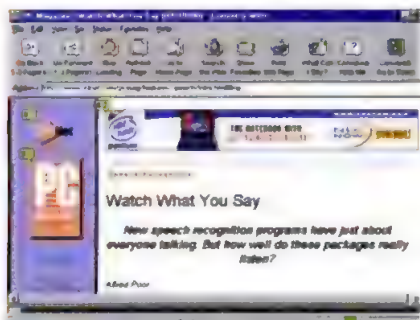
Conversa Web brought voice recognition to Web browsing, but early versions sometimes left you groping for the mouse or keyboard. The product's limitations were reflected in some of the

problem: navigating through frames. With Conversa's Saycon technology—providing icons that you can "say"—you can speak a link anywhere on the screen, and it will be selected. The program will activate the link as soon as you say enough

to distinguish it from the remaining links.

To scroll an adjacent frame, just say "Next frame." You can even open multiple instances of your browser and use the "Next window" command to switch between them.

Want to know which links are available? Just ask Conversa Web to read them aloud. And special links are no longer a problem. Open a text box and speak to spell text or use voice commands to scroll through drop-down lists to select your choice. You can even choose buttons; to activate a button marked Submit, just say



TALK IT UP: Conversa Web 3.0 has solved many former problems.

reader comments we received; one respondent mentioned problems with frames and accuracy. Well, put your feet on the desk and strap on your headset, because Conversa Web 3.0 solves many of these problems.

Let's start with the toughest

www.secondlooks.com

Tell us what you think... How do you like the new products you're using? Second Looks is your forum for feedback. Join us online to tell us about your experiences. We discuss a different new product each week and summarize your comments here. Following are some of your comments from our discussion of ICQ.

Yes, it's bloated, but the new features don't get in the way: You don't have to use them if you don't want to. Most people are complaining about imperfections in the functions that (they say) they won't ever use. The only real problems are long loading times and some firewall problems. People need to be more constructive and realize that it's free.

—Aaron

Once my chat program of choice, ICQ's network has become increasingly unreliable and its software increasingly bloated and buggy. The extra sounds are the sort of thing that charms you for about 15 seconds and then quickly becomes annoying. I switched to Yahoo! Messenger, myself. It's more reliable.

—William Leary

"Press Submit." Graphical map hotspots and difficult-to-name links get numbered Saycons that make them easy to select.

The program still works on top of Microsoft Internet Explorer, which one respondent lamented; it requires IE4 or higher. Conversa has no plans as of this writing to incorporate Conversa Web into Netscape browsers.

The program still doesn't re-

quire any training of the voice-recognition engine; there are some tweak settings available to help Conversa Web recognize your voice. The program sells for \$59.95 and is available through retail channels or directly from Conversa (425-895-1800). If you're looking for the easiest way to surf without lifting a finger, have a chat with Conversa Web.

A dramatic photograph of an astronaut in a white spacesuit floating in the void of space. The Earth's blue and white horizon is visible in the background, with a bright sun or star creating a lens flare effect on the right side. The astronaut's helmet and part of the suit are in the foreground, looking towards the right.

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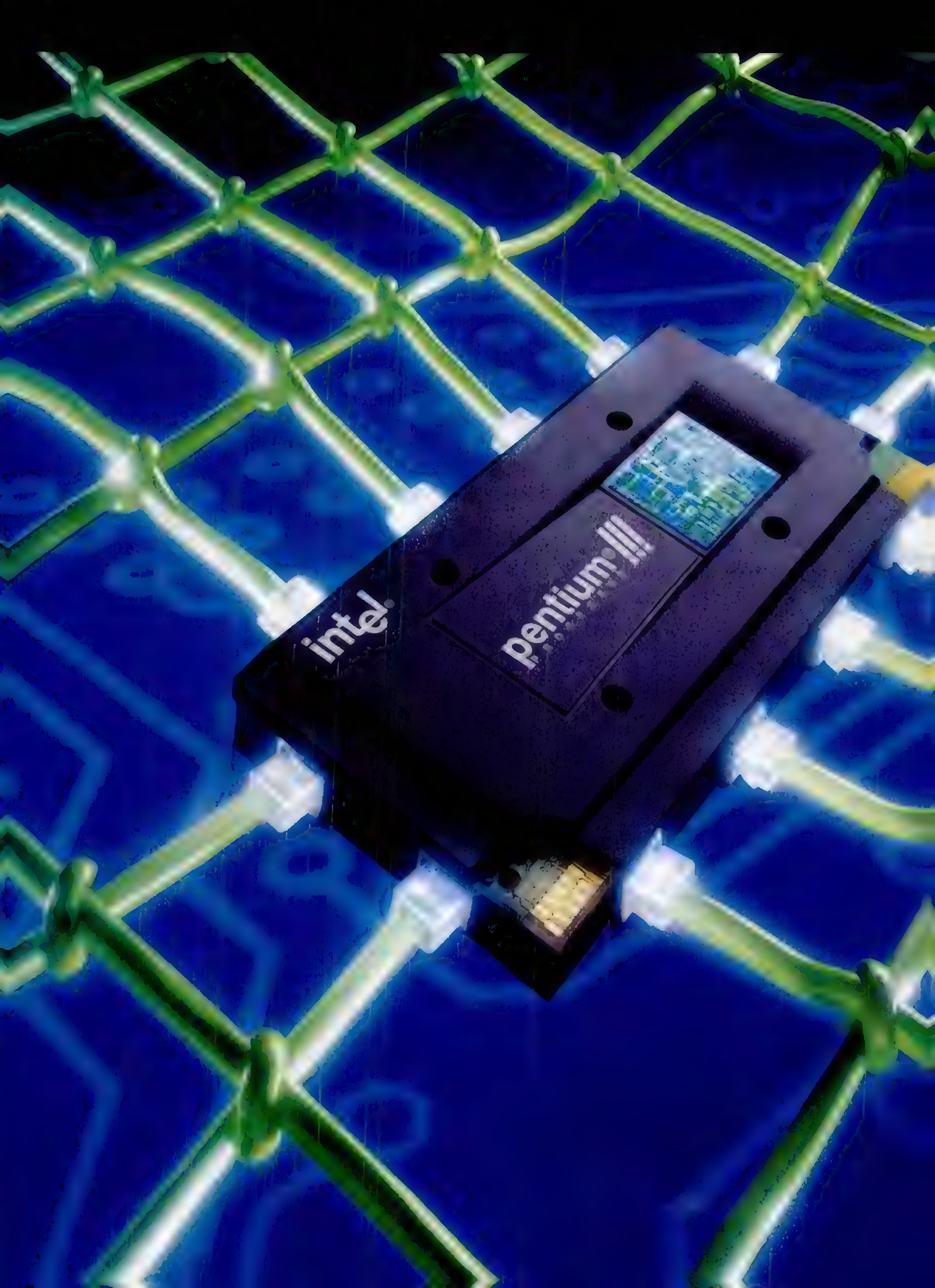
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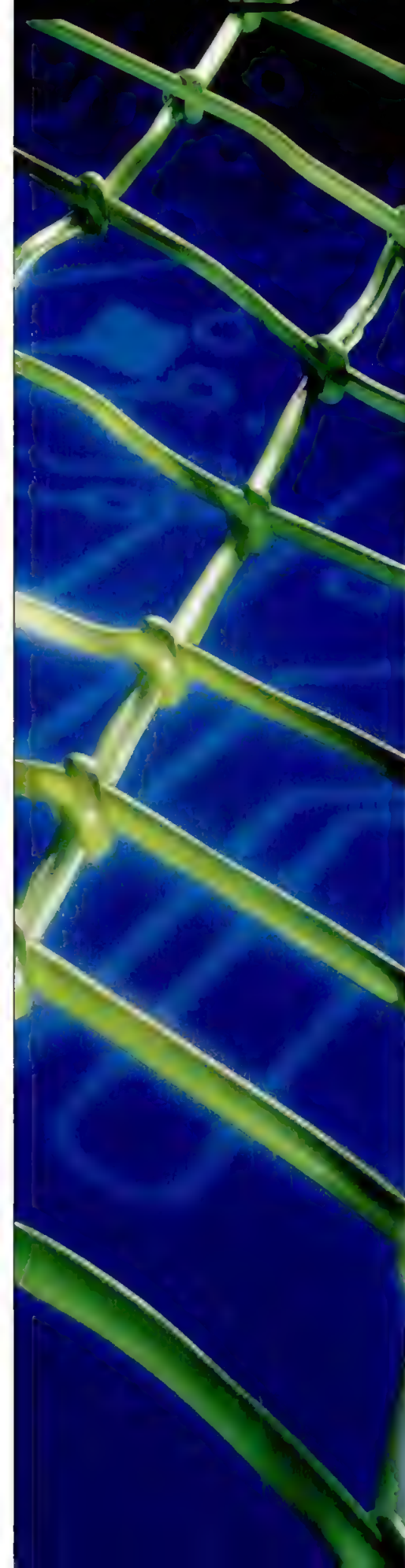
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*Stanford Resources Inc. Quarterly Monitor Report Q4 '98 and Display Search Quarterly Supply vs. Demand Study: LCD Monitors Q1 '99

Bill Machrone

Film's Dead. Are Actors Next?

I witnessed the death of film the other day. I went to a digital screening of *Star Wars Episode I: The Phantom Menace*, the phenomenally successful prequel to the *Star Wars* saga. The theater I visited was equipped with a Texas Instruments DLP Cinema system. I had seen the conventional film the day it

opened, and the difference was dramatic.

The digital version flowed from a hard disk through a processor to the DLP chips. Light bounced off the micromirrors and then to the screen, a quick trip through \$100,000 worth of the latest technology to hit the big screen. The picture quality was emphatically better than with conventional film projection. There was no projector noise, no flicker, no scratches on the film, no splices, and no reel-change cues. Every scene was crisp and clear. The image will never fade.

And this was just projection. George Lucas intends to shoot his next *Star Wars* film digitally, with no film whatsoever. He figures that the technology will be ready in time; digital editing suites are available today, although they will make vast strides in both price and performance in the next few years. This makes me wonder what will happen to the look of future movies. Film has a definite look that sets it apart from television: a different color gamut, different contrast ratios, and a variety of effects that are tied to film chemistry, such as reciprocity failure, solarization, overexposure, and underexposure.

Cinematographers will have to learn a new language of luminance and chrominance, bit rates, pixel density, RGB values, and lux levels. They'll have electronic "shutters" at their disposal, which will be able to capture hundreds or even thousands of images per second. The blurred backgrounds we see as the camera pans will be a thing of the past—unless the director wants them.

In their editing suites, they'll be able to drop frames, freeze frames, and morph and tween frames at will. They'll be able to dilate and compress time, to split screens and combine images. We may see a whole new vocabulary of on-screen imagery, such as details in an action scene depicted in dreamy slow motion while the overall scene takes place at break-

to create a visual representation that's believable to our eyes, as long as we're willing to believe in a stalk-eyed amphibian that speaks pidgin hip-hop.

More interesting are the scenes in which nothing is real—the battle between the droid army and the Gungans, for example. Thousands of characters that don't actually exist fight it out on a digital landscape. We'll still need primary actors for a while, but we will soon have no need for extras to fill up those battlefields and crowd scenes.

If you can make a believable alien, can you make a believable human? It's much harder, because we scrutinize our fellow sapients far more closely, judging all sorts of things such as hair color, eye shape, asymmetry in the face, skin texture, the way muscles move under the skin, and a thousand other subtleties that can't be explained away by the extraterrestrial label.

Even more challenging than the visual representation of a digital actor is a voice. A believable synthesized human voice that reads from a script with proper emotion is well beyond the reach of current technology, and is likely to remain so for a couple of decades at least.

As discriminating as the human eye is, the ear is even more so. Our eyes readily accept the flickering, fuzzy data streams of movies and TV and convert them to an internal representation of a 3-D world. Between our color vision spectrum and visual sensitivity, our eyes have remarkable bandwidth. But they're relatively insensitive to data rate. Our ears, conversely, have limited bandwidth, but they are exquisitely sensitive to tiny breaks and interruptions, to things that don't ring true.

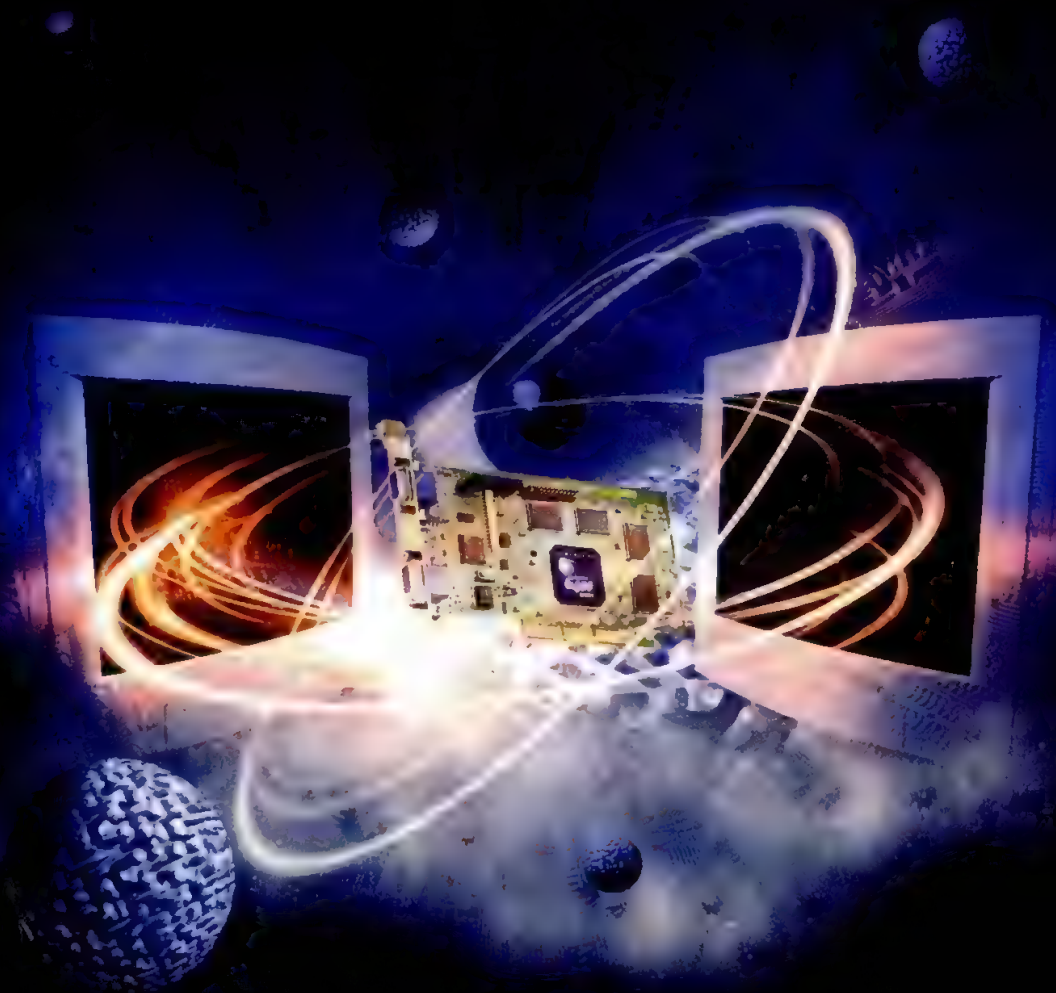
Consumer film photography is only a couple of product cycles away from obsolescence. Inexpensive 2-megapixel cameras and 1,000-dpi printers will inevitably take over, as the products' prices drop. Mak-



All of the *Star Wars* movies have pushed the state of the art of special effects, and the latest one is no different.

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Talk back to Bill
Machrone in our



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Intel Inside

PC Paranoia

The post-PC era. That's what many observers are calling the next generation of computing. Microsoft is calling it the PC-plus era, hoping to keep the nearly ubiquitous PC from going away and forcing Microsoft to sell software for WebTVs and hand-held gizmos. In fact, Microsoft should simply ignore this debate, because it's beneath the company to worry about the impossible. This isn't a new era. I wonder what sort of screwball influence caused this thinking.

I've been following this scene since its inception, and I began to write about it in 1978, which makes me wonder why I can't get a real job. There have been many moments when the PC scene was pronounced dead or about to be dead. There's a reluctance to admit that the entire world's population at some point will be using computers. This is difficult for people to accept—especially those over 14.

There's something about the PC that bugs us. We've never even been comfortable naming it. At first it was the microcomputer, then the personal computer, then the PC, then the desktop, and even the personal workstation.

In the post-PC era we're supposed to turn to embedded computers in gadgets and gizmos rather than to the general-purpose PC. This thinking has always baffled me, because the PC's survival was due to its versatility, not in spite of it. In the 1970s and early 1980s, IBM, Lanier, and Xerox made dedicated word processors. The microcomputer wiped them out overnight. No specialty device can compete with a general-purpose, programmable, PC-type device. It's the software! The programmability of the PC is the consistently overlooked factor.

This is not to say that we won't have embedded computers in everything else. It is to say that just because the refrigerator has a computer built in doesn't mean we've become post-PC. And interfacing the refrigerator (or washer, or dryer, or coffee maker) to the PC won't be necessary either. So it's not a PC-plus era. The PC era is standalone and forever, and we should get used to it.

The personal computer is the most successful consumer electronics device in history, and yet people seem unable to think of it as anything other than a passing fad. I'm amazed at how many people still haven't learned how to use them, even though they've been on the market for 24 years! Do people

still think they're going to go away? Are people buying into the nonsense about the post-PC era? What exactly is it about computers that puts so many people into denial and creates this desire to bury the thing?

In the 1950s, computers were called electronic brains. This moniker led to the weird thinking that created offbeat, anticomputer science fiction a few years later and changed a generation's attitude toward computing.

The real kicker came during the hippie era, when two cynical movies forever altered the sociology of computing. The blockbuster *2001: A Space Odyssey* (1968) featured a computer named HAL that killed the crew and tried to kill some guy named Dave. This talking computer was creepy. *2001* was followed by a movie called *Colossus: The Forbin Project* (1969), in which a computer takes over the world.

The timing of these films drops them right into the path of the influential baby boomers. This accounts for the fact that older folks and younger folks use computers more than the 35 to 50 crowd. This phenomenon was always explained by saying that the demographic was too busy to use computers. Young slackers had nothing else to do but surf and play computer games. Oldsters also had a lot of time to putter on the 'puter.

This rationale makes no real sense, since 35- to 50-year-olds are working more and need to use computers more than ever. This group, incidentally, is part of the reason you keep hearing about how teachers know less than their students do when it comes to computers. This same group of people was traumatized by *2001*. Ask teachers who know next to nothing about computers if they saw *2001* when it came out, and they will all say yes.

I suppose that all this is kind of a tribute to the power of literature and movie-making. We always have to fear and beware of them as propaganda tools. In fact, we should fear them a whole lot more than the computer!



Ask teachers who know next to nothing about computers if they saw *2001* when it came out, and they will all say yes.

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John C. Dvorak's



INSIDE TRACK

Just before the deadline passed for National Semiconductor to shutter Cyrix and throw its collective arms in the air, a small Taiwanese chip company that has an ongoing beef with Intel **bought Cyrix** and intends to keep making Cyrix chips. The company is Via Technologies—one of the support chip set makers promoting the 133-MHz system bus.

Apparently Intel is not too pleased with any company supporting this bus (since Intel doesn't, I guess) and has been saber rattling about the whole thing. Threats of a **lawsuit** have supposedly hurt Via's business with Intel customers, so the company figures it can circumvent the problem by making its own processors.

I've always said that it's been a **long wait** for Taiwan and even Korea to get into the processor business in a big way. The market will be interesting to watch, as the Taiwanese should attack the low end aggressively.

What makes this **doubly interesting** are the new chip designs that should be coming out of Intel to lower costs even further. **Beyond Celeron** is a chip called the **Tinma processor**. This is close to the Cyrix GX in concept, with **built-in graphics** and built-in north-bridge logic. This chip should be hitting the streets in late 2000.

The Tinma is said to be a 0.18-micron part, with 128K of L2 cache and a **direct Rambus memory controller**. This controller is the kicker: It's apparently going to hit the market as part of a high-performance, low-price strategy. The biggest gamble is the graphics aspect of the chip. One wonders what specifications will be used, how it fits into a world that's slowly moving toward digital LCDs, and about the **serious problems** making digital display output devices work universally. If I were Intel I'd pass on the graphics component for a few more years.

Iridium, Iridium, Whither Iridium Dept.: According to recent trade reports, Motorola is rethinking its wireless strategies. Right now the company is **losing a billion bucks** a year on the once-hyped Iridium satellite phone network. I remember when this turkey was dreamed up, and even then I thought it was a bad idea. I found the proposed charges to be **the funniest part**. One pundit said that an Iridium call would cost about \$4 per minute, which I thought was too high. But most observers and analysts said it was actually too low! I was told, "People will want this service so bad that they'll gladly pay \$10 a minute for it! You can make a call from Mount Everest!" And we know how important that is.

So Iridium now sits out there and **languishes** under the inept Motorola marketing machine. And why would anyone use such a system when it looks like nothing more than a rip-off at every turn? A handset costs almost \$3,000. The service is typically \$200 a month,

on top of a \$500 setup fee. I assume the \$500 is used to **flip a switch** that tells the satellite to expect to see calls from the new phone.

The per-minute charge varies with the service provider. The best flat rate I've seen is \$6.75 per minute from Paradise Wireless. A 10-minute call would cost \$67.50. Only people on yachts in the mid-Pacific could rationalize such a charge, and most of those folks have elaborate radios for such purposes anyway.

This entire product category seems **useful only for rich backpackers in northern Brazil**. Could Motorola find a smaller niche? It gets worse when you shop around and find variable-rate service providers, where some calls cost \$10 to \$12 a minute! Oh, yeah, there's another problem: all sorts of differing fee schedules depending on the service provider.

Anyway, the system's base costs are bad, too. A 7-ounce battery is \$300. The charger is \$200. There's a device the size of your thumb that looks like a \$1.50 Radio Shack doodad, which plugs into the back of a cable TV connector to turn a 75-ohm connection into a 300-ohm antenna connection. The Motorola thing is called an antenna adapter and sells for \$85. Who are these guys kidding?

Oh yeah, and for all you Net heads who need an **emergency Internet connection** inside a jungle in Borneo, you can get a **whopping 2,400-Kbps** throughput over Iridium. Whoa Nellie. The only good thing about Iridium is that on many systems callers pay only for calls they make. Outside callers pay for calls to an Iridium phone. So **beware** of calling 8816 and 8817 numbers, which are the Iridium prefixes.

Keeping Up with the Buzzwords Dept.: First there was AI, then fuzzy logic, then neural nets, then data mining. Now look for a new term: **data fusion**.

This specialty stems from research into military targeting systems. The idea is to make sense of information overload in order to achieve pattern recognition as good as a person's. I think. Supposedly these systems will be able to do all the things that AI, fuzzy logic, and neural nets said they could do but never did. I'm dubious, but I like the term. Sounds hip.

Genuinely Interesting Software Dept.: If you buy software for your children, you have to find brands that can be **relied upon** to keep them entertained long enough that you don't feel **you were ripped off**. No company has done this better than Humongous Entertainment. In particular, the Freddi Fish, Pajama Sam, Putt-Putt, and SPY Fox series of games are all great. These are probably **the most consistent, charming, and well-coded children's games ever done**. The offbeat Blue's Clues (from the TV series) is also a winner. I cannot recommend these games enough. **Just buy them all**. End of well-deserved plug. **PC**

*For Net heads who
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Whoa Nellie.*

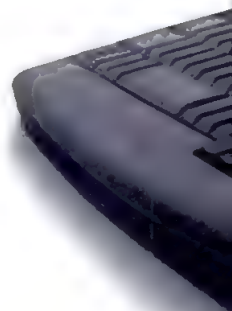
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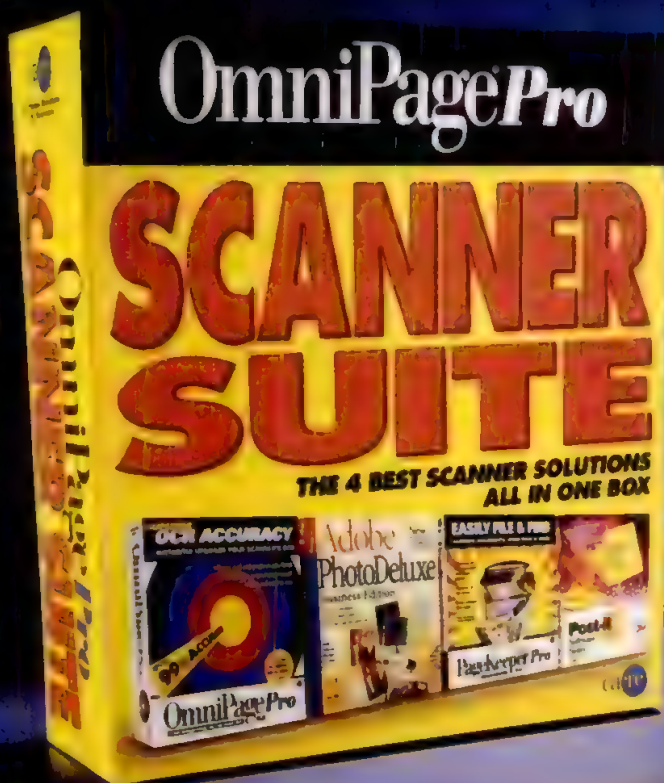




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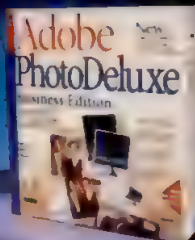
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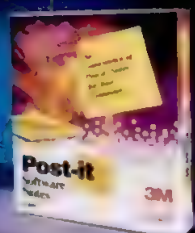
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Y2K and Your Family

As promised last time, let's look at the noncomputer side of Y2K: the steps you should consider taking to prepare for any possible interruptions or dislocations a few months from now. Wait much longer and you'll be limiting your options.

(Next issue, I'll dive back into hardware and software, with some recommen-

dations on great new products I've been working with at the top and bottom of the price scale.)

In general, in first-world countries and especially in the U.S. and Canada, the Y2K situation is looking better than most of us who've been following this expected. Both government agencies and private and public companies have been focusing on working the kinks out of date-sensitive computer systems, to avoid major crises on January 1, 2000.

As I've said before, I don't expect to see widespread and enduring problems, civil disobedience, or pervasive and continuing shortages and outages. I believe that in North America, the biggest problems will be temporary electrical outages, plus sporadic shortages of water, some medicines, and possibly food. And while we'll have millions of little glitches—"Dear Mr. Seymour: We regret to inform you that according to our records, you are now minus-61 years old, and thus no longer eligible for our program. Have a nice day."—they won't have much real impact.

Do you live in a part of the country that will be affected by these scattered outages and shortages? I don't know, and neither do you. About all we can predict now is that because the calendar changes in early winter, problems that do arise will affect those in northern latitudes more than those in the South.

No matter where you live, it's prudent to think *now* about steps you can take to prepare yourself and your family for whatever happens in your area, to minimize the effects of Y2K-related problems.

Here's the six-point checklist I've been recommending to friends:

1. Talk to your friends, neighbors, and family members about possible Y2K problems now. The effects of many possible Y2K-related problems can be mitigated by advance planning and cooperation. You need to know the general level of awareness among those who live near you about any Y2K disruptions ahead, and you, your family, and your neighbors need to be ready to help one another.

2. Talk with your family now about what kinds of Y2K problems might arise and what they'd mean to you. This is

important in three ways: It raises consciousness, it gives family members the sense of security that comes from having anticipated and discussed possible problems, and it draws out good ideas. Your kids especially need both the reassurance that things will be okay and a forum for their own ideas—many of which you would never think of yourself. My 8-year-old son popped up with the idea of a "Y2K Weekend" this summer, with no electricity, TV, phones, turning on of the water tap, or cooking. It was a *great* idea; we did it and had a wonderful experience. We not only got the obvious benefits of learning all the ways we could do without some of the things we're used to, if we have to, but we—all of us—learned a lot about ourselves and about each other.

3. Assess your own situation. Every family's requirements are different. The possible Y2K issues facing a family living on the 37th floor of an Upper East Side New York apartment, in the icy grip of early January, with no electric, sewage, or water service, are very different from those of a family in a four-bedroom ranch-style house in a suburb of Phoenix. Talk with your local government and utility Y2K-compliance officers about their assessment of their own state of readiness.

4. Stockpile judiciously. If anyone in your family routinely takes maintenance drugs—insulin, Prozac, or high-blood-pressure medication, for example—stock up for an extra month or two now. Get some bottled water. Get a little packaged food you can eat without much preparation. *But don't go crazy: You're not stocking up for Armageddon.* Don't fill your garage and closets with years' worth of banana chips and freeze-dried ice cream. You just want to be able to get through any possible temporary problems—distribution-system failures and electrical problems that knock out refrigeration and maybe your grocer's ability to open for business—for a few days. Keep some extra cash around, but don't make yourself a target for a burglary or create huge tax problems for yourself by cashing out of your stock portfolio at year's end.



I worry about dangerous, eccentric, selfish, and unnecessary acts by people like you and me.

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5. Make and organize paper copies of everything important. If your bank, insurers, medical-care providers, and others temporarily lose access to their account records, you want recent paper copies of those records at hand, both for peace of mind and in case you need them to straighten out computer-failure-induced errors. Let Y2K become your incentive to do what you should have already done: Gather and safely file at home (not in a potentially inaccessible bank safety-deposit box) essential health, financial, citizenship, and education records.

6. Keep reassessing. Over the next few months, the state of Y2K-readiness will change dramatically. Keep up to date on what your local utilities, public safety agencies, and others say they're doing and on their reported states of Y2K-compliance.

Finally, I'm often asked what worries me most about the year 2000. Here are my big four concerns.

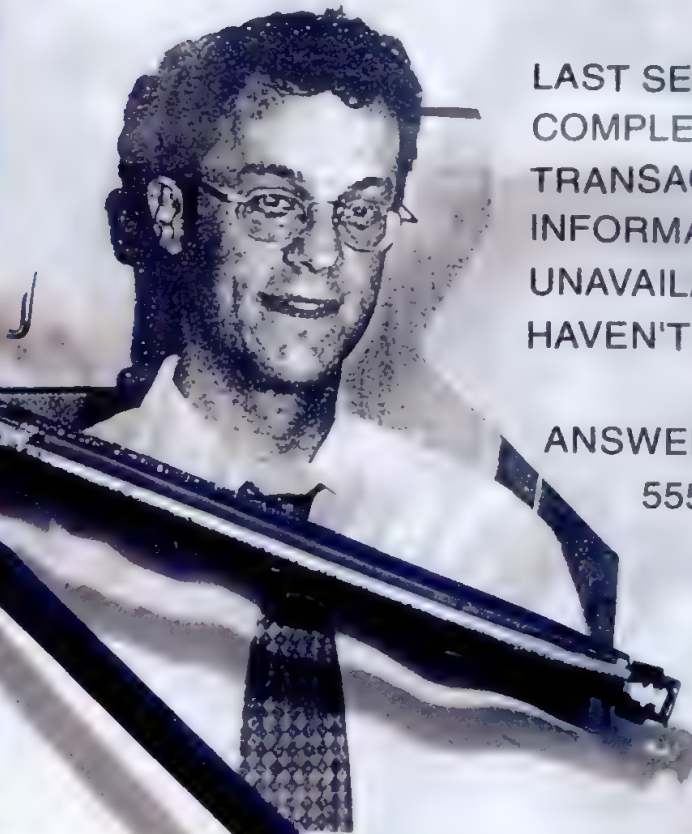
- **Interconnectedness.** I worry that you and I and our employers, suppliers, and public agencies will all do what we need to get Y2K-ready, but we'll be blindsided by problems with other entities upon which our systems rely.

- **Utilities.** I worry a lot about America's electric utilities, on both the power-generation and power-distribution sides. If there's no juice, there's no water, sewage pumping, waste-water treatment, and so on. We have a huge patchwork of electric utilities, and some, especially the smaller ones, are certainly going to have severe problems.

- **Lawyers.** Y2K is going to be the Lawyers' Full-Employment Act. We'll lose a trillion dollars or more out of our GNP to unproductive lawsuits and legal fees. And Washington doesn't seem interested in ameliorating this.

- **You and me.** Finally, I worry about dangerous, eccentric, selfish, and unnecessary acts by people like you and me. A run on America's banks, large-scale hoarding (and worse, profiteering by reselling from those hoards), and the spreading of false information could create large-scale Y2K problems where none would otherwise exist. Please: Don't play that game. **PC**

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Bill Howard

Another Kind of Drive

Can you think of a consumer device containing several dozen microprocessors with 90-plus percent penetration of the U.S. market? Most people get a new one every three or four years. Fanatics (mostly male) spend their free time worshipping them. And truly bad things happen when they crash.

Indeed, there are many parallels between the personal computer, which this year passed the 50 percent penetration mark for U.S. households, and the passenger car, which has near-universal penetration outside major cities. The two industries could learn from each other's strengths. The PC industry would benefit from embracing the reliability and stability of the embedded software inside cars. The auto industry would benefit from adopting the PC industry's fierce determination to bring new products to market quickly at ever-cheaper prices.

Consider the BMW 750iL, arguably one of the world's highest-technology cars. This \$92,100 vehicle has approximately 110 microprocessors controlling the engine, emissions, traction control, cornering, braking, navigation, seat-position memory, and even parking distance. But some owners are less than enthusiastic about the ages of the high-technology accessories. The basic design of the car's integrated cellular phone is approaching ten years old. BMW dealers charge up to \$1,000 for this phone on lesser models.

BMW's navigation system, standard on the 750iL and \$1,800 on other models, has been around since 1994, and it too is mostly unchanged: a 33-MHz Motorola 68010 microprocessor (remember them?) doing the calculations and a 1X CD-ROM drive for the mapping data. All this sounds archaic in PC terms. But it functions and gets you where you're going. The system doesn't lock up or require constant bug fixes. Can you imagine a version of Windows or Windows CE so stable that you'd feel comfortable burning it into an embedded ROM chip? Conversely, can you imagine Delorme or Band Me-

moving closer over the next few years. Cars represent a huge untapped market for software and PC makers. Already, Clarion and Microsoft have introduced a Windows-based in-dash navigation system that also replaces the radio, called the Clarion AutoPC (www.autopc.com), although it's not a match for in-car systems with 5-inch displays.

Getting information in and out of the car is a work in progress. Voice input is likely to come to cars over the next few years to control basic functions (such as "defrost the windshield," "find rock music stations," and "map the quickest route to Hartford via the Tappan Zee Bridge"). Many auto makers have joined the consortium developing Bluetooth, the 2.4-GHz short-range, radio-frequency standard. The group hopes to see initial products out in the first half of 2000. With Bluetooth transceivers in cell phones and PDAs, you'll be able to plan a trip on your desktop PC, transfer route data to your PDA or phone, and then uplink it to your car. Once we have one universal digital cellular standard in the U.S. rather than three (TDMA, GSM, and CDMA), you'll be able to get real-time traffic advisories and information.

Does everyone want so much technology in a car? For instance, do you want a rear-seat entertainment center (a big LCD panel plus a video-cassette or DVD player)? Today it's entertainment only, but in five years, you could have a constant link to the Internet. We're also on the verge of active distance control on freeways, and we're within a decade of licking the technical problems that hinder hands-off driving.

The "complexity" of electronics—multiplexing control signals over a single wire rather than run-



Cars represent a huge untapped market for software and PC manufacturers.



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Microsoft Management Console (MMC) Snap-In Interface



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Cover Story

PC Magazine Labs tests 40 products and services for protecting yourself and your business.

ARE YOU SAFE ONLINE?

By Neil Randall & Sarah L. Roberts-Witt

Illustrations by Alison Seiffer

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Protect Your Business.....151

Plus:
Top Security & Privacy Tips.....139

Security Threats to Your Desktop...



COOKIES A bit of data that helps Web sites remember who you are. In most cases, you don't know that a site is transferring a cookie to your PC or what it contains.



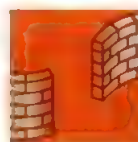
HISTORY LISTS AND CACHE As you travel around the Web, your browser keeps a list of the places you've visited and stores the files you downloaded.



MALICIOUS CODE Applets and scripts deliver a more interactive Web experience. But in the wrong hands mobile code can be used to delete files or steal data.



VIRUSES, WORMS, AND HOAXES A virus is a program that replicates and spreads from PC to PC. These have the potential to destroy data or bring down your system.



ACCESS TO YOUR PC FROM NETWORK Via your network or your home cable modem, computers can gain access to your files and use resources such as printers.



SPAM Spam is unsolicited e-mail, usually containing commercial advertising. Aside from being annoying, spam shifts the costs of advertising onto the ISPs and consumers.



SNOOPING E-mail passes through many hands on its way to its ultimate destination, creating many opportunities for prying eyes to gain access.



SPOOFING Sending an e-mail message with a phony address is about as easy as writing a false return address on the outside of an envelope.

The Internet is a lot like a big city. There's a seemingly endless list of sites to see and things to do. But there can also be dangers lurking just around the corner.

Judging from the mainstream press, you'd think the Web was in the throes of a crime wave. Stories about viruses and evil programs destroying your files, hackers attacking your system, and sites snatching private details on you and your finances grab page-one headlines and lead off the 11:00 news. While the truth is not quite that bad, the Internet does expose you and your business to a series of security and privacy threats. And the problem seems to be growing.

In survey after survey, Internet users consistently rank concerns about security and privacy as the chief factors for not shopping online. Most commercial Web sites do collect personal or demographic

information from users. But there's little evidence that corporations are taking the steps necessary to prevent others from gaining access to such information by breaking into their Web sites or networks.

Hardly the sort of stats that inspire confidence! But the solution is not to pull the plug and avoid the Internet. Just as in the big city, if you understand the threats and take the necessary precautions, you can be reasonably sure of having a safe visit.

ON A PERSONAL LEVEL

When using the Internet, there are several steps you need to take to protect your security and your privacy. Your first job is to separate the hype from the reality. Some problems are truly cause for alarm; others are more theoretical than real.

For example, much has been made of the threats posed by ActiveX controls and Java applets, and by scripting (JavaScript

and VBScript). Generally, these applets are designed to create more engaging, interactive pages, but like any program that is run on your PC, they could be used to disable your system, destroy data, or swipe sensitive information.

Although there are many demonstrations of such malicious mobile code, computer viruses remain more of a real-world threat. In fact, the Internet has created new avenues for viruses and related dangers, such as worms and Trojan horses, to spread and inflict damage. The recent ExploreZip worm and Melissa macro virus demonstrate how quickly

Online Shoppers' Concerns

Far and away, the top concerns that online shoppers express are related to privacy and security, according to a recent poll of 1,000 U.S. Internet users.

Privacy and security	53%
Can't inspect product	29%
Unfamiliar with process	6%
Don't want to wait for delivery	3%
No concerns	13%

Source: NetZero Report, April 1999

Our Contributors: NEIL RANDALL is a contributing editor of *PC Magazine*, and SARAH L. ROBERTS-WITT is a freelance writer. EDWARD MENDELSON is a contributing editor; LARRY M. SELTZER and DAVID HASKIN are frequent contributors. ROBERT P. LIPSCHUTZ is a director at Viant, a Boston-based Internet consulting firm. DIANE JECKER and KEVIN YOUNG were the project leaders, and senior associate editors DAVID LIDSKY and JOHN MORRIS were in charge of this story.

...and How to Protect Yourself



MANAGE YOUR COOKIES

Your browser can warn you when it sees a cookie, but a cookie manager can accept or reject cookies automatically.

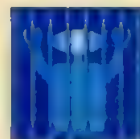
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COVER YOUR TRACKS

Security suites and cookie managers let you clear out your history list and more, on demand or on a schedule.

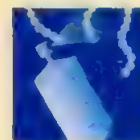
Page 136



BLOCK MALICIOUS CODE

You can use any of the security suites we review here to specify sites from which to accept or reject mobile code.

Page 108



INOCULATE YOUR PC

An antivirus program is essential. It uses various scanning methods to detect viruses and disinfect your PC.

Page 108



PUT UP A FIREWALL

Not just for corporations, firewalls can be used on your own system to prevent access via a network or the Internet.

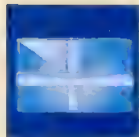
Page 108



FILTER SPAM

Most major e-mail clients have filters you can use to minimize spam. For more comprehensive protection, you need a spam-filtering tool.

Page 127



ENCRYPT E-MAIL

To ensure that only the intended recipient reads your e-mail use encryption. In this story, we review seven plug-ins for e-mail clients that make encryption much easier.

Page 114



USE A DIGITAL SIGNATURE

There's no guarantee that the people you're exchanging e-mail with are who they say they are, unless they use digital signatures to verify their identities.

Page 114

viruses can spread and how much damage they can cause.

Last year, corporations experienced 86.5 virus encounters per 1,000 machines, compared with 62.5 encounters per 1,000 machines in 1997, according to ICSA. To protect your system from viruses, install an antivirus program and update it at least once a month. The security suites reviewed in this story include antivirus protection. For standalone protection, we recommend Symantec Corp.'s Norton AntiVirus 5.0 (reviewed in "Desktop Anti-virus: Defend Your PC," May 4, 1999).

The second step is to understand that

from a privacy standpoint, using the Web is a tradeoff: To get a more personalized experience, you have to give up more personal information. Pick a level you're comfortable with and stick to it by monitoring the practices of Web sites and the technologies they use to keep track of you, such as cookies.

Online privacy has become a hot-button issue as more organizations have started doing business on the Web. A year ago, the situation was so bad that government agencies were pushing for federal regulation of Web sites. Since then, more online businesses have posted

privacy policies, but 93 percent collect personal information and 57 percent gather demographic information from users, according to a recent study conducted for the Federal Trade Commission. These growing databases create new opportunities for businesses but greater privacy risks for consumers.

The problem has prompted the formation of watchdog groups such as BBBOnline (www.bbbonline.com) and TRUSTe (www.truste.org), which certify sites that adhere to strict privacy guidelines. Heavyweights such as Disney, IBM, and Microsoft have announced that they will no longer advertise on sites that lack privacy policies. Meanwhile, the World Wide Web Consortium (www.w3.org) is working on a standard for the exchange of personal information between consumers and Web sites called P3P (Platform for Privacy Preferences).

Not all security and privacy problems relate to information coming into your PC from the outside world. The information you send out can also be a risk to your security or privacy, because it makes several stops on different servers en route to its final destination. Along the way, your

Internet Privacy

Percentage of commercial sites that collect personal information from consumers. Based on a sample of 361 commercial sites from Media Metrix's top 7,500 URLs in January 1999.

Personal information*	93%
Demographic information**	57%
Both (personal and demographic)	56%
None	7%

Corporate Security

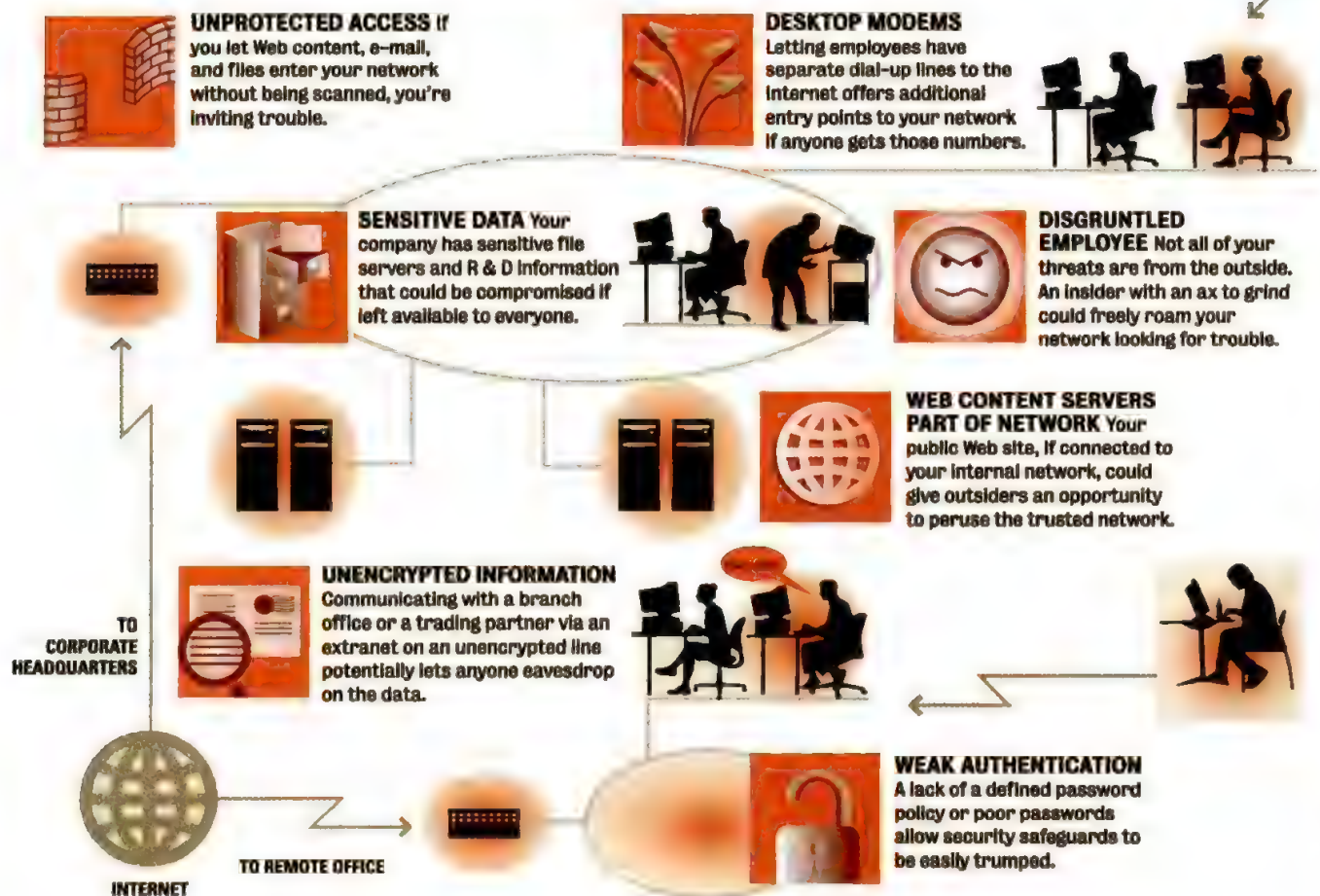
Consumers aren't the only ones vulnerable to internet attacks. Big businesses have security problems, too.

Internet-connected organizations that have serious security flaws: 70%

Source: ICSA Inc.

* Personal information includes name, e-mail address, postal address, telephone number, and the like.
 ** Demographic information includes age, gender, income level, and preferences.
 Source: Georgetown Internet Privacy Policy Study, a report to the Federal Trade Commission, March 1999.

Security Threats to Your Business...



data is vulnerable to anyone who has access to the servers, as well as to hackers.

When providing any sensitive data such as credit card numbers, always be sure that you are using a secure connection to the server. Protecting your e-mail can be a little more complicated. To make sure that only your intended recipient is getting the message, you have to make it unreadable to others by using encryption. It is also a good idea to sign your e-mail messages digitally; this proves they came from you and haven't been tampered with.

Before rushing out to buy security utilities, make sure you are taking advantage of the tools already on your system. Microsoft Windows 95/98 and your Web browser and e-mail client all have security features that can address some of the problems discussed here. Then, when you're ready to tighten security, consider some of the 21 Internet security tools cov-

ered in our section on personal security and privacy.

GETTING DOWN TO BUSINESS

On the business side, protecting your data and your Web site is even more crucial. You need to be connected to the Internet to serve your customers and to interact with your employees and your suppliers, but giving only the right people access to the right data is a huge concern.

You need to be worried about protecting your business secrets, the private information of your customers, and the integrity of your Web site itself. After all, if your Web succumbs to hackers, how can customers feel confident you are adequately protecting their private data?

In a survey conducted at the Gartner Group Information Security Conference earlier this summer, 75 percent of those attending reported that their organiza-

tions plan to increase spending on security products and services during the next year. All this spending is for good reason, too. The Computer Security Institute estimates that corporations suffered more than \$100 million in losses last year



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► PC Magazine Free Utilities

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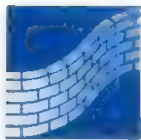
Check out our library of downloadable utilities, including Internet security tools.

► Center for Democracy and Technology

www.cdt.org

The CDT advocates using encryption software and tracks legislation about free speech and privacy issues on the Internet.

...and How to Protect It



INTERNET GATEWAY FIREWALLS are placed at key entry points to your trusted networks.
Page 152



REMOTE-ACCESS SERVERS replace desktop modems. Incoming and outgoing calls must go through these controlled points.
Page 139



DEPARTMENTAL FIREWALLS are placed in front of sensitive internal data resources. They keep the curious and malicious out.
Page 152



INTRUSION DETECTION SYSTEMS monitor for internal attacks. The system agents must be distributed throughout the network to keep watch.
Page 158



WEB CONTENT SERVERS should be kept physically separate from the internal network. They should be placed on a special area of the network.
Page 139



VIRTUAL PRIVATE NETWORKING will let you communicate with your trading partners by using an encrypted line.
Page 165



STRONG PASSWORD POLICIES and additional authentication methods, such as smart cards and biometrics, improve protection at the desktop level.
Page 139



because of successful cyberattacks. Though many such hacks are no more than mischief-making publicity stunts, they can cause you downtime and cost you credibility, as evidenced by the frenzy of hacker activity directed against gov-

ernment and other sites of late.

Whether you decide to tackle your security needs in-house or outsource them, you need to adhere to some basic guidelines. First, conduct a network assessment to determine exactly what is running, where it is running, and why. Though you could rely on internal staff and tools like the vulnerability scanners we review in this issue, you should probably hire an objective outside party. Anderson Consulting, Deloitte Consulting, Ernst & Young, and IBM, among others, provide these services.

Second, a good security policy is essential. This document should include guidelines for physical security, such as who can access Web servers and who can't, as well as instructions for user behavior. Some 80 percent of all security breaches come from inside the firewall, according to Internet Security Systems, and lax securi-

ty inside can inadvertently open your network to external threats.

Last, do your homework. According to the International Center for Security Analysis, 70 percent of the Web sites with certified commercial firewalls were still vulnerable to attacks because of misconfiguration or improper deployment, proving that security products are only as good as the people who configure them.

In the following sections, we've identified five categories of products to safeguard your PC and your privacy, as well as four technologies that can help businesses participate in the Internet revolution without compromising their security. The Internet economy has spawned tremendous opportunities, but with that comes some risk. By taking a few proactive steps, however, you and your organization can avoid becoming a security statistic and instead become an online success story.

► Coalition Against Unsolicited Commercial Email

www.cauce.org

CAUCE is an all-volunteer organization that lobbies for a legislative solution to spam mail.

► Computer Emergency Response Team Coordination Center

www.cert.org

Part of Carnegie Mellon University, CERT tracks computer security incidents and issues advisories that summarize threats.

► International Computer Security Association

www.icsa.net

ICSA provides Internet security services. The site's library has white papers on everything from cryptography to malicious code.

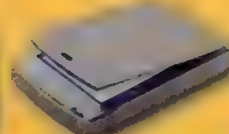
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Protect *your* PC And Your Privacy

Before venturing online, make sure you have security in-line. These tools help safeguard your data and privacy from Internet assaults.

By John Morris

On the surface, using the Internet seems to be a pretty innocent activity. When you enter the address of a Web site, the text and graphics appear in your browser. And when you send an e-mail message, it rushes to its destination. But behind the scenes, there's a lot more going on.

As you view a Web page, small programs and scripts can be downloaded and run on your PC. Web sites store information on your system so they can remember who you are. And, as the information that you exchange through your Web browser or via e-mail bounces from server to server, it can be easy prey for hackers. In this section, we review a variety of tools that can help you combat these personal threats.

The closest you can get to an all-in-one Internet security solution is a suite. Not all security suites have the same features, but all suites do let you control what active content (ActiveX controls, Java applets, and scripts, which are downloaded from Web sites) has access to your system. Some also provide firewalls to let you control access by other users, clear out debris such as cookies and history left behind by browsing, and even speed up browsing by preventing pages from displaying advertisements.

Like Web sites, e-mail is not inherently secure. For exchanging sensitive data—or simply for personal privacy—you can make sure no one else is reading your messages by using a secure mail solution. In this story, we looked at seven plug-ins that work with your existing mail client and use encryption and digital signatures to ensure the security and authenticity of e-mail.

One of the surest signs that e-mail is open to abuse is spam—unsolicited, commercial e-mail. If spam is clogging your in-box, you need one of the spam filters we review here. These tools look for telltale signs of spam mail, and delete or flag such messages before you download and read them.

To stay secure, you need to use and regularly change passwords. But how can you keep track of the user names and passwords for all those Web sites and applications? The solution is a password manager, which stashes all of your passwords and related information in a single, secure virtual vault.

Before purchasing any of these packages, be sure you're using the security features already available on your system. Both Microsoft Internet Explorer and Netscape Navigator let you block active content and cookies. Get an anti-virus program, and make sure you download updates at least once a month.

By taking these basic precautions and using a few well-chosen tools, you are certain to have a safe, satisfying Internet experience.



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SECURITY SUITES

E

stablish a Defensive Line

By Larry Seltzer



Security suites attempt to address all of the threats you're likely to encounter when using the Internet. That's a tall order, so it is perhaps no surprise that the three suites reviewed here vary widely in their abilities and effectiveness.

Two suites, WRQ's AtGuard 3.1 and Aladdin Knowledge Systems' eSafe Protect Desktop 2.1, have firewalls, which control access to your PC from other computers. To use a firewall, you create rules describing who can have access to your PC, when they can use it, and what types of activities are permitted.

All three help monitor the content that you download from Web pages such as ActiveX controls, Java applets, JavaScript, VBScript, as well as cookies. Although you can configure your browser simply to block such content, security suites give you greater control. For instance, you can create lists of trusted sites (Internet Explorer 4.0 or later has a similar feature called Zones, but security suites are easier to use). Only eSafe Protect lets you download content and run it locally to test it without risk.

WRQ throws in a tool that blocks sites from displaying ad banners. But this controversial feature—content providers equate it with stealing—did not always work effectively.

AtGuard 3.1

\$29.95 list. WRQ Inc., Seattle, WA; 800-872-2829, 206-217-7100; www.atguard.com.

● Although WRQ pushes it as a utility for enhanced browsing—specifically, its ability to block ad banners—AtGuard's strongest suit is security. AtGuard has a little of everything including a personal

firewall, an ActiveX/Java applet blocker, and a cookie manager.

AtGuard includes neither printed nor electronic documentation, but its site provides a program tour and help documentation. This will also come in handy during installation, because the program's setup fails to explain that the default installation includes only the ad-blocking feature.

The program's main interface, or Dashboard, looks a little like the Windows taskbar with a series of controls, icons, and statistical readouts. You configure the product by right clicking on the Dashboard and choosing Settings, or by clicking on the AtGuard icon in the Windows system tray. From the Dashboard you can view details on the Internet traffic moving in and out of your system and how AtGuard is handling it.

Although the firewall is a powerful feature, many users will have trouble configuring it properly. The options can be cryptic. For example, when we attempted to connect to another system on the network, AtGuard asked us whether a new outbound TCP permit rule should apply only to "Win32 Network Interface Service Process" or to any application. Most users would have been completely lost.

The other major security tool in AtGuard is designed to protect your system from active content such as ActiveX, cookies, Java, and JavaScript. All current browsers already let you shut these off, but AtGuard lets you do so on a site-by-site basis.

AtGuard focuses on blocking dangerous content before it reaches your PC, so you will still need an antivirus program to detect and handle hostile programs already on your PC. Unlike Aladdin Knowledge Systems' eSafe Protect and Network Associates' GuardDog, AtGuard offers no virus protection. And it cannot block access to system files or sensitive content by malicious code that is running locally.

Editors' Choice



The Internet is not a danger zone, but you do need to take steps to safeguard your PC

and your privacy. Of the products we tested, these four tools offer the best personal protection.

● eSafe Protect Desktop 2.1

A security utility for the Internet age, Aladdin Knowledge Systems' eSafe Protect addresses a broad range of online threats. Only eSafe has a sandbox area where you can run downloaded applets to determine if they are safe. Other security features in eSafe Protect include an antivirus program, a personal firewall, and a cookie manager.

● SpamKiller 2.60

It takes a strong package to stand up to the onslaught of spam. Novasoft's SpamKiller 2.60 is up to the challenge. Working in tandem with any POP3 and MAPI e-mail account, SpamKiller checks your mail on a schedule you determine, uses a wide range of parameters to detect spam, and steers suspect messages into a killed mail folder.

● InvisiMail Deluxe 4.0

The purpose of a secure e-mail add-on is to make it easier to exchange e-mail securely. InvisiMail is not S/MIME or PGP compatible (it uses its own RPK algorithm to encode and decode messages), but it lets you effortlessly encrypt and digitally sign e-mail messages within most popular e-mail clients. InvisiMail also secures data stored on your hard disk.

● Password Safe 1.7

Counterpane Systems' Password Safe is an easy, secure, and free solution to the password problem. Password Safe locks all of your user names and passwords in a vault and encrypts them using the strong Blowfish algorithm for maximum protection. For a more novel approach to password management, take a look at PassLogix's v-GO Universal Password Plus!

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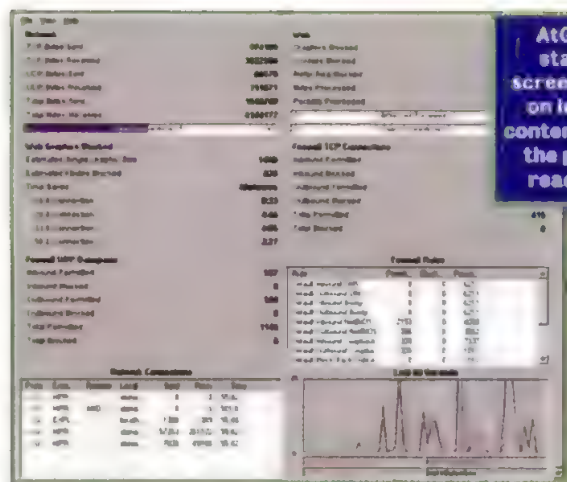
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From the program's Privacy tab, you can specify whether or not you want to receive cookies from Web sites and prevent your browser from supplying other information to Web servers. The program contains a wizard that will let you choose all these settings dynamically.

The central feature of AtGuard is a tool that blocks the ad banners on Web sites. It does so by searching for patterns in URLs such as text strings containing "/ads/". AtGuard comes preconfigured with scores of such patterns for most popular sites, and you can add your own. This feature may sound appealing, but in practice, we found it did not work smoothly. On some sites, AtGuard blocked nearly all of the editorial content, and it often blocked graphics such as button bars.

As a security solution, AtGuard is best suited for experienced users as a supplement to their existing antivirus programs.

eSafe Protect Desktop 2.1

\$39 street. Aladdin Knowledge Systems, Seattle; 888-772-3372, 206-524-9159; www.esafe.com.



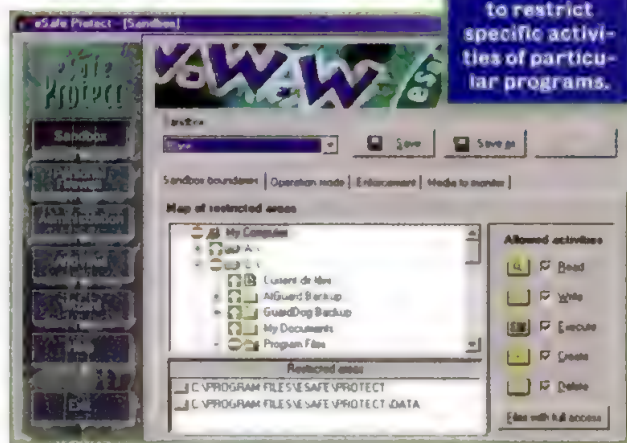
Aladdin Knowledge Systems' eSafe Protect does it all. For \$39, it includes thorough antivirus protection, a security "sandbox" where you can safely run potentially dangerous programs to vet them, an ActiveX/Java blocker, and a personal firewall solution. No other product we tested is so complete.

To access eSafe, you click on its system tray icon. The program's interface comes in three flavors: Small, Normal, and Advanced. The Small window registers only incoming content and notes and any

eSafe's documentation frequently refers to "vandals," such as hostile scripts, ActiveX controls, and Java applets, but macro viruses and other threats such as Trojan horse executables are far more prevalent on the Internet. Fortunately, eSafe protects against those as well.

The antivirus engine supports both automatic and on-demand scanning. We ran several Word and Excel viruses through it, and eSafe found and disinfected them all. In some cases, however, it also had to eliminate valid macros in order to disinfect the file. The antivirus program also provides a heuristic virus scanner for finding macros written in Microsoft Visual Basic for Applications. eSafe can take a variety of actions upon discovering a virus and has a flexible scheduler as well.

The sandbox feature makes eSafe stand out in this roundup. eSafe uses Windows virtual device drivers to monitor operations by other programs, particularly Internet-enabled programs, and ensure that they don't misbehave.



potential threat from that content with a speedometer-style gauge. The Normal and Advanced displays, which occupy more desktop space, provide you with more configuration options.

In eSafe's world, threatening active content can come from all quarters, and in testing, even the most innocuous JavaScript was flagged as a potential but minor threat.

You can configure the rules generally or for a particular application.

More practical for everyday security concerns, the Personal Firewall has a flexible content-blocking system and a port-filtering firewall. With the Personal Firewall, you can block sites according to domain name or IP address. You can add to the lists of eSafe's forbidden words, which eSafe will check for in Web addresses and content, and block if necessary. And, as with Network Associates' Guard Dog, you can tag specific sensitive data, such as your social security number or credit card number. If that data is about to be transmitted, eSafe will halt the browser, warn you, and offer to abort the operation. If others use your PC, you can create rule sets for the firewall and sandbox, and lock those settings so that they cannot be modified by other users.

If you only plan to purchase one utility for antivirus protection and Internet security, eSafe is the clear choice.

Guard Dog 2.05

\$39 list. Network Associates, Santa Clara, CA; 800-338-8754; www.mcafee.com.

● Guard Dog from Network Associates addresses basic security and privacy, but it lacks the more advanced features found in other security suites. When Guard Dog comes across downloaded Internet content, for example, it has no real mechanism for determining whether or not the content is safe; instead, it just barks away, warning you of possible danger. And unlike AtGuard and eSafe, it does not work with Windows NT.

A straightforward installation process leads you directly into a well-designed configuration wizard. At this point, you can give Guard Dog your personal information (so it knows what data to protect) and tell it which features you want to use.

Guard Dog protects this personal information by watching the data leaving your computer to see if it contains anything sensitive. You can specify whether or



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Security Suites

	AtGuard 3.1	eSafe Protect Desktop 2.1	Guard Dog 2.05
■ YES □ NO			
Installation and setup	Fair	Excellent	Good
Protection	Excellent	Excellent	Good
Privacy	Good	Good	Excellent
FEATURES			
Firewall	■	■	□
Blocks/monitors mobile code	■ □	■ ■	■ □
Blocks cookies	■	■	■
Cleans history	■	■	■
Password manager	□	□	■
Scheduler	□	■	■
Blocks ad banners	■	□	□
Activity log	■	■	■

not Guard Dog should let your system give out specific types of information globally, but you can't approve access to data on a site-by-site basis.

One of Guard Dog's main purposes is cookie management. Guard Dog warns you when a site has issued a cookie, and

also specifies when it has come from a different server than the one you're viewing—a tell-tale sign of an ad banner. Guard Dog then presents the option of always accepting or rejecting this cookie whenever you visit the same site. Additionally, Guard Dog offers a Web Trail Cleaner, which deletes your browser cache, history, cookies and the Windows Recycle bin. You can set it to run on a schedule or when you close your browser.

To prevent unauthorized access to critical and sensitive files, such as your e-mail file and Quicken data, Guard Dog has a feature called File Guardian. Although File Guardian will block malicious mobile code—ActiveX controls or Java applets—from harming critical files, it does nothing to address sim-

ple network access, because it lacks firewall protection.

GateKeeper, another protective feature, monitors outgoing data and warns you when you browse a site that hasn't been approved or is suspected by Guard Dog of containing malicious code. But if you return to the same page during that session or anytime prior to rebooting, Guard Dog's Gatekeeper will not post the same warning. Network Associates says it plans to fix this bug by the time you read this.

Like AtGuard, Guard Dog offers a detailed statistics area. The CheckUp procedure can help you diagnose potential problems. For instance, it logs how many cookies you have accepted, scans for viruses, and tells you if you set the security levels in Microsoft Internet Explorer too low.

Guard Dog, like eSafe Protect, comes with antivirus protection. Network Associates, however, doesn't update the virus information files in Guard Dog on a regular basis, as does McAfee VirusScan.

There are a lot of tempting features in Guard Dog, especially the privacy features, but McAfee has some catching up to do.



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SECURE E-MAIL

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By David Haskin



When you send e-mail, you probably assume that the person you send it to is the only person reading it. But that's not necessarily the case. Like a postcard, an e-mail message makes several stops, and at each stop there's a chance someone will read it before it reaches its destination.

Secure e-mail solutions address this problem by using encryption and digital signatures. Encryption programs encode text into unreadable cipher text for transmission over public networks, and then, once received, decode it. Most e-mail clients and add-ons use public-key encryption, a process that requires a pair of keys—one on each end—to encode and decode messages. The security of the messages is dictated by the key length—the longer the key, the tougher it is to crack. Digital signatures prove that you are who you say you are and that your message hasn't been tampered with during transmission. Your secure mail solution can generate one, or you can download one from a service such as VeriSign.

Most users do not send secure e-mail, because it remains too difficult to use, and competing standards (S/MIME and PGP/MIME) make exchanging secure e-mail hit or miss. For this story, we tested seven secure e-mail plug-ins that address some of these problems, making it easier to exchange e-mail securely.

InvisiMail Deluxe 4.0

\$44.99 list. InvisiMail International, Philadelphia; www.invisimail.com.



A proprietary e-mail encryption tool, InvisiMail Deluxe 4.0 from InvisiMail International requires that both sender and receiver use the program. If you don't mind this limitation, it is a good choice, as it secures messages in a simpler way than the other plug-ins in this roundup.

InvisiMail works with most popular POP3 e-mail clients, such as Netscape Messenger and Microsoft Outlook Express, with which we tested it. It also supports popular shareware and freeware clients such as Calypso and Pegasus Mail.

The first time you exchange a message with another InvisiMail user, it automatically exchanges public keys. Thereafter, InvisiMail encrypts all messages from the sender, and decrypts all messages for the recipient. Added security features include digital signatures on all messages and encryption of data on your system with a simple drag-and-drop tool.

To try it, you can download InvisiMail Intro, a freeware version that encrypts and

Take Control of Cookies

Product	Price/Company	URL	Description	Supported Browsers
Cookie Cruncher 2.11	Free/RBA Software, Rancho Cucamonga, CA	www.rbaworld.com	Cookie Cruncher differentiates between AOL, IE, and Netscape cookies. It has an intuitive interface, but it has difficulty locating cookie files on your hard disk and presents very few options for managing them.	AOL 3, 4; IE3, IE4, IE5; Navigator 3.x, 4.x
Cookie Crusher 2.1	\$15 list/The Limit Software, East Chicago, IN; 219-838-5561	www.thelimitsoft.com	Cookie Crusher confronts cookies before they're stored on your hard disk, and it provides session statistics on most types of cookies. You can accept or reject cookies from certain Web sites. When its running, Cookie Crusher overrides IE's Internet Options.	IE3, IE4, IE5; Navigator 3.x, 4.x
Cookie Cutter PC 2.61	\$15 list/AyeCor Software, St. Paul, MN	www.ayecor.com	From Cookie Cutter's simple interface, you can automatically delete all cookies or select individual cookies for deletion or retention. It can also search a hard disk for cookies, but it lacks configuration options.	IE3, IE4, IE5; Navigator 3.x, 4.x
 Cookie Pal 1.5	\$15 list/Kookaburra Software, San Jose, CA	www.kburra.com	Cookie Pal is easy to configure and use, and its features include an activity dialog with multiple tabs. It handles IE4 shell integration, monitors current sessions, and lets you add session cookies to accept or reject lists.	IE3, IE4, IE5; Navigator 3.x, 4.x
Cookie Server 1.01	\$30 list/Newfangled Software, San Jose, CA; 408-223-2461	www.newfangled-san-jose.ca.us	Cookie Server manages persistent cookies and cookies in communication flow. It has a useful help system and an extensive set of features. It works through firewalls and supports multiple browser profiles in Navigator.	IE3, IE4, IE5; Navigator 3.x, 4.08; Opera 3.0
Cookie Terminator	\$15 list/4Developers LLC, Sunnyvale, CA	www.4developers.com	Cookie Terminator has a single-screen interface with limited dialogs. You can choose to delete cookies automatically or manually, individually or en masse.	IE3, IE4, IE5; Navigator 3.x, 4.x
IEClean 5.0 / NSClean32 4.02	\$40 list (each)/Privacy Software Corp., Voorheesville, NY	www.nsclean.com	IEClean and NSClean32 manage ActiveX controls, Java, news folders, mail folders, cached information, and cookies. They let you specify precisely which cookies you want to keep and control session cookies residing in memory.	IE3, IE4, IE5 / Navigator 3.x, 4.x
Purge Cache, Cookies and Tracks for IE	\$20 list/Assistance and Resources for Computing Inc.	www.zdnet.com/swlib	As its name suggests, Purge Cache, Cookies and Tracks handles a variety of data types. Although it won't let you specify which Web sites are okay and which are questionable, you can choose to delete specific data types (for example, cookies only).	IE4, IE5
Window Washer 2.6	\$30 list/Webroot Software Inc., Boulder, CO; 800-772-9383	www.webroot.com	Window Washer is a simple, complete data-cleanup package with limited cookie management. Its offerings include a recycle bin and a recent documents folder. To accept or reject cookies, you can view a list of cookies.	AOL 4, 5; IE3, IE4, IE5; Navigator 3.x, 4.x; Opera

NEC



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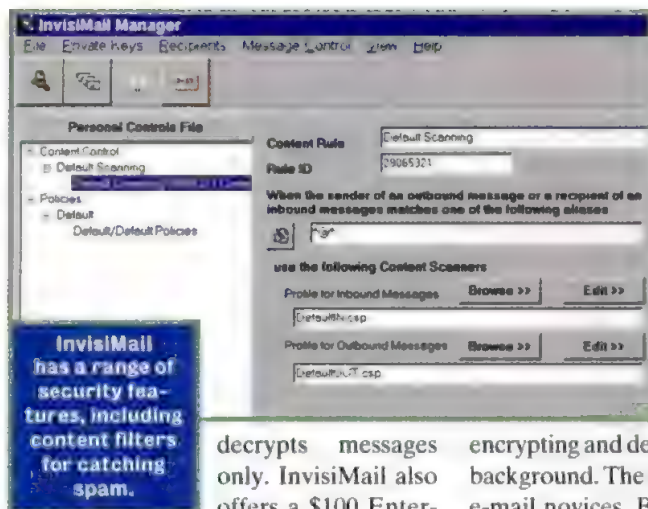
monitors with a heritage of engineering excellence, quality and durability. And from one of the few companies that both design and manufacture their own equipment too. So next time you're looking for a computer, don't

miss applications? MultiSync® from NEC Technologies, Inc.

helps you look at the future.



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decrypts messages only. InvisiMail also offers a \$100 Enterprise version that scans entire e-mail messages for spam and either deletes them or marks such messages for viewing later.

InvisiMail Deluxe lives up to its name. It makes the process of secure e-mail exchange virtually invisible to end-users.

IronWare Mail

\$79 list for two licenses. AEC Ltd., Bayerova, Czech Republic; 420-5-412-35466-7; www.aec-security.com.

● IronWare Mail from AEC uses its own e-mail security protocols, requiring that both the sender and the receiver have the program. It offers good management and security features, but the encryption is awkward to use.

With IronWare Mail you can easily manage public keys, which enable the receiver to decrypt e-mail. Just exchange the keys via e-mail or removable disks and import them into IronWare Mail. All your public keys appear both in a drop-down list within the interface and in a separate window.

Although it has useful management and security options, IronWare Mail's encryption/decryption process is cumbersome. You type your message in any application, copy it to the clipboard, open IronWare Mail, and encrypt the message. Then you must select the recipient's public key from a drop-down list, paste the encrypted message into the editing window of your e-mail program, and send the message. To decrypt the message, the recipient does the process in reverse.

IronWare Mail offers ironclad security, but its encryption process is primitive and poorly implemented.

MAILguardian 1.1

\$20 list. Vanguard Security Technologies Ltd., West Orange, NJ; 888-450-0775; www.vguard.com.

● Vanguard Security Technologies' MAILguardian 1.1 takes the difficulty out of encrypted e-mail. Once you set it up, MAILguardian practically runs itself, so you'll hardly know it is

encrypting and decrypting messages in the background. The product is well suited for e-mail novices. But to make the process this easy to use, Vanguard had to make some trade-offs.

MAILguardian works with all SMTP/POP3 e-mail programs. MAILguardian 1.1 does not use key pairs—only private keys. The company claims it is still safe, because MAILguardian encrypts keys before sending them. Vanguard plans to include support for public keys in MAILguardian later this year.

Before you can send and receive encrypted e-mails, you must create a secure channel. First you send an e-mail, and MAILguardian automatically attaches a private key. If the intended recipient uses MAILguardian, an invisible e-mail message containing the recipient's key is immediately placed in the recipient's outbox and sent back to you the next time the recipient sends e-mail to anyone, thus establishing the channel. MAILguardian conveniently displays all users with whom you've exchanged keys in a single dialog box. If you send a message to a person with whom you haven't exchanged keys, a dialog box pops up to remind you the message won't be secure.

For some, MAILguardian's use of a proprietary protocol to interact with your e-mail program is a drawback, because both sides of the correspondence must use the product. The company says that future releases will support S/MIME version 3, so you can send encrypted messages to anyone, no matter what application is used to decrypt it.

If you are not concerned with having the maximum security available, MAILguardian offers good protection and great ease of use.

MailSecure 2.4

\$49.95 list. Baltimore Technologies, Waltham, MA; 877-228-9754; www.baltimore.com.

● One of two S/MIME plug-ins in this roundup, MailSecure 2.4 from Baltimore Technologies has limited features. On the other hand, it is simple and convenient to use, especially because you don't have to rely on the receiver having MailSecure or using the same e-mail program.

MailSecure works only with Microsoft e-mail clients and Eudora; we tested it with Microsoft Outlook 2000. During installation, MailSecure builds itself into the menu system of the host client without any user interaction. Like several of the other encryption utilities, you exchange public keys by exchanging messages with a recipient. Once you've traded keys with someone, whenever you send a message to that person, MailSecure displays a dialog box asking if you want to sign it, encrypt it, or do both.

Management features include an intuitive dialog box for organizing public keys and digital certificates, which authenticate e-mail senders. MailSecure enables you to save certificates easily to a local hard disk, or to retrieve certificates from an LDAP (Lightweight Directory Access Protocol) server.

Previous versions of MailSecure were buggy and balky, but we encountered no such problems during our testing of Version 2.4. MailSecure does not have the breadth of features of non-S/MIME products like PGP Personal Privacy. But it is S/MIME certified, and if that's important to you, you'll appreciate this easy way to add an extra level of security to your messages.

Navaho Lock 2.4

\$39.95 list. CyPost Corp., North Vancouver, BC; 877-297-6781; www.cypost.com.

● Navaho Lock 2.4 from CyPost Corp. takes a decidedly unique approach to e-mail encryption. Rather than supplying its own algorithms, it uses the Microsoft Windows cryptographic service provider (CSP) in your operating system. Navaho works well with your existing e-mail program.

Although most users probably don't even know it is there, CSP is a part of Windows 95, 98, and NT, and you can download CSP updates from Microsoft's

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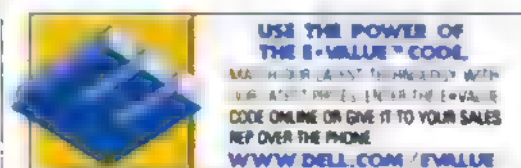
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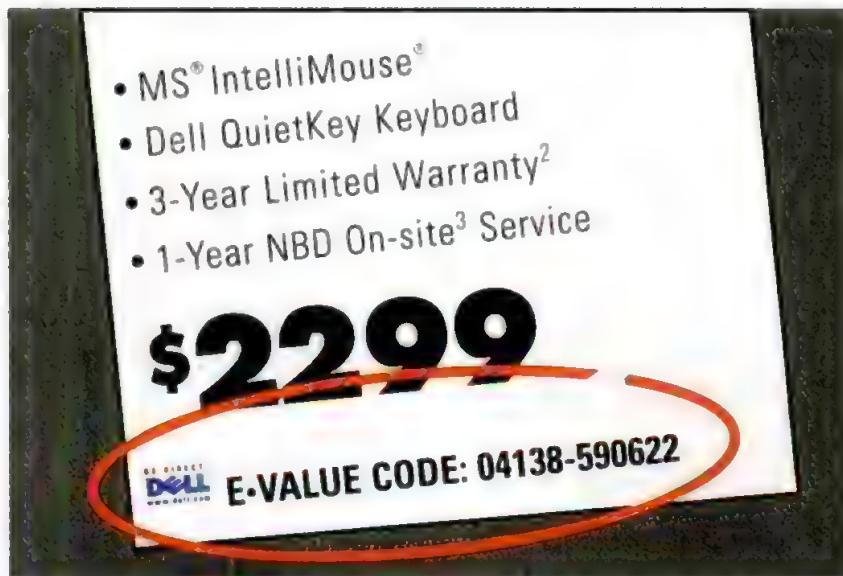
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Secure E-mail

	InvisiMail Deluxe 4.0	IronWare Mail	MAIL- guardian 1.1	Mail- Secure 2.4	Navaho Lock 2.4	PGP Personal Privacy 6.02	Trusted- MIME 1.4
■ YES □ NO							
Installation and configuration	Good	Fair	Good	Good	Good	Good	Good
Support for multiple mail accounts/clients	Excellent	Excellent	Good	Good	Good	Fair	Good
Key management	Good	Good	Good	Good	Fair	Good	Good
FEATURES							
Supports Microsoft Outlook/ Outlook Express	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ □
Supports Eudora	■	□	■	■	■	■	□
Supports Netscape Messenger	■	□	■	□	■	□	□
ALGORITHMS							
DES/Triple-DES/RC2	□ □ □	■ ■ □	■ ■ □	■ ■ ■	N/A	□ ■ □	□ ■ ■
Blowfish/Other	□ ■ *	■ ■	■ □	□ □	□ □	□ ■	□ □
Key lengths	607-1,279	56-2,400	40-1,024	512-2,048	Up to 128 bit	1,024-4,906	512-2,048
AUTHENTICATION							
Sending MD2 / MD5 / SHA1	□ □ ■	□ ■ ■	□ ■ □	■ ■ ■	□ □ ■	□ ■ ■	□ ■ ■
Receiving MD2 / MD5 / SHA1	□ □ ■	□ ■ ■	□ ■ □	■ ■ ■	□ □ ■	□ ■ ■	□ □ ■
Compliant with PGP / S-MIME	□ □	□ ■	□ □	■ ■	□ □	■ □	□ ■

* This product uses the proprietary algorithm RPK. N/A—Not applicable. This product uses Microsoft Windows cryptographic service provider (CSP).

Web site. The latest versions of CSP support strong encryption such as Triple-DES, which in turn lets Navaho Lock use this encryption algorithm.

To send encrypted e-mail, you create messages in Navaho Lock's Windows Explorer-like interface and select a recipient from the Navaho Lock address book. If you want to add attachments, you can go to the left side of the interface, which displays files for you to drag to the editing Window, where it adds the text to the message. You can also drop files in the top section of the interface and Navaho Lock will automatically compress and encrypt the attachment.

By clicking a toolbar button in Navaho Lock, you can send the message via your regular e-mail client (Claris EMailer; Qualcomm's Eudora; Microsoft Outlook Express, Outlook 98, and 2000; and Netscape Messenger). Handily, it can also import the address books from Outlook and Outlook Express.

Navaho Lock is not compatible with S/MIME and PGP/MIME programs. The sender must use Navaho Lock, but recipients can download a free Navaho File Viewer to decrypt messages and attachments. Like MAILguardian, Navaho Lock uses a single key.

Navaho Lock is a simple solution that

is best suited for Outlook and Outlook Express users who want to send encrypted messages with attachments.

PGP Personal Privacy 6.02

\$39 list. Network Associates Inc., Santa Clara, CA; 800-338-8754; www.mcafee.com.

● More than just an e-mail encryption tool, Network Associates' PGP Personal Privacy 6.02, available only from the company's Web site, can secure data files as well. The standard-bearer for the PGP/MIME protocol, Personal Privacy will dazzle anyone looking for a total solution that is easy to use. Personal Privacy offers several intriguing features that set it apart from the other encryption applications in this roundup.

Like MailSecure 2.4, Personal Privacy integrates itself into the menus of e-mail clients. It works only with Claris EMailer, Eudora, and Microsoft Outlook. We tested it with Eudora Pro 4.1.

In addition, you can use it with the freestanding PGP Tools toolbar, which has buttons for basic tasks such as encrypting messages or for adding, decrypting, and verifying certificates. It also has a button that displays an applet for logging on to a PGP key server to find someone's public key.

You can also exchange keys via e-mail or floppy disk. Uniquely, you can person-

alize your public key by adding a small thumbnail image, such as your photo. For extra security, you can distribute parts of a key to multiple users; then all the users must use their parts of the key in order to decrypt the message.

The next version of PGP Personal Privacy, Version 6.5, will offer self-decrypting files, which you can send to those who don't have an encryption program. The recipients will unlock encrypted messages with passwords that you give them. This version should be available by the time you read this.

PGP Personal Privacy does not operate with S/MIME programs, but it is an extremely thorough and secure program, great for those new to e-mail encryption.

TrustedMIME 1.4

\$50 list. SSE Ltd., a Siemens Co., Dublin, Ireland; 353-1-216-2900; www.sse.ie.

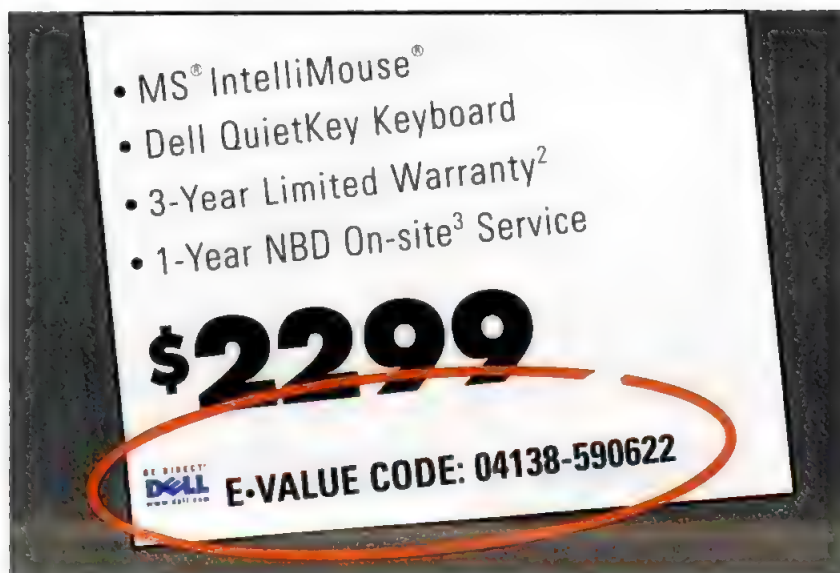
● Targeted at users of Lotus Notes or Microsoft e-mail clients, TrustedMIME 1.4 from SSE is an S/MIME-compatible plug-in that offers good security in an easy-to-use package.

If you have a public key for a recipient, TrustedMIME lets you encrypt a message, digitally sign it, or do both. If you don't have a key for that recipient, it will tell you that it cannot send an encrypted e-mail to that person. To find a key among those you have collected, you open a dialog box where you type in the user name; then TrustedMIME searches for the user among a repository of public keys.

TrustedMIME adds a menu to your e-mail client. From that menu, you can perform tasks such as changing your password and importing or exporting digital certificates, which verify the authenticity of senders' identities. Its dialog box for managing certificates lets you designate a trust level, from none to complete, for each certificate by clicking on it and selecting a level.

Because it tightly integrates with e-mail programs, TrustedMIME offers fast access to options and requires little setting up by the user. TrustedMIME is an excellent choice for those who want to add easy S/MIME encryption to their messaging solutions.

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SPAM FILTERS

Stop Junk Mail

By Neil Randall



In its infancy, the Internet was a utopia where people from all over the world shared research and discussed common interests. Today, the Web has become a marketplace as well, with all the trappings of commerce—including junk mail.

All major e-mail programs now include tools that help you block spam by letting you create your own filters based on addresses or text in the message. But you must manually configure the filters, and you first have to read the spam to know what to block.

Spam filtering utilities, on the other hand, provide a good defensive solution by working with your e-mail client. Some filters offer up to 15,000 filters, based on addresses of known spammers or common text strings (such as XXX). Even better, some delete spam before you download and read it.

For this story, we tested 11 spam filters, 5 of which receive complete reviews. With any of these tools, you can stop spam before it reaches your in-box.

eFilter Spamnet

\$12 direct. TSW Inc., Seattle; www.eflash.com/spamnet.

● TSW's eFilter Spamnet is promising. The program is easy to configure and use, and at \$12 it is the lowest-priced product we reviewed. But it lacks the more advanced filtering features found in other products reviewed here.

eFilter works only with POP3 servers, and it does not support Microsoft Outlook and Outlook Express e-mail programs. Unlike most spam-filtering packages, eFilter doesn't force you to enter detailed information about your mail servers and e-mail clients up front. At each stage of the installation, eFilter offers a range of options and a concise explanation of each step.

When eFilter finds "good" e-mail on the server, it can automatically launch your e-mail client. You can also configure the program either to leave mail on the server or to download it to your mail client, and then launch when you connect to the Internet and close when you disconnect.

After installation, eFilter's interface brings up a Preferences window, which provides you with an extensive dialog box with Help buttons available beside each field. In this window you can spec-

ify your e-mail accounts and the clients you use to access them. And you can set ways to handle mail, such as choosing to have the offending spam dumped in a trash folder.

The Preferences window includes a right pane devoted to adding keywords and acceptable e-mail addresses for filtering purposes. Unlike other packages, such as Spam Buster and SpamEater Pro, eFilter doesn't include a list of known spammers. In the keywords field, you can add an unlimited number of phrases to the 20 that come with eFilter. You can set different filtering configurations on each mail account.

You can download a free, ten-day trial version from TSW's Web site.

Interceptor 1.0

\$25 list. Grok Developments Inc., Surrey, Great Britain; 44-181-547-2304; www.grok.co.uk.

● A good utility should do its job quietly and stay out of the way. That's precisely the approach behind Grok Developments' Interceptor 1.0. Interceptor stands between any standard e-mail client and your ISP's POP3 mail server, weeding out unwanted e-mail messages.

Because Interceptor acts as a local POP3 proxy server, to use it you must first modify any references in your e-mail

client to your POP3 server to read "localhost" or "127.0.0.1." Whenever you use your e-mail client to check for new mail, Interceptor springs into action. Only messages that comply with Interceptor's filters are downloaded and dropped into your in-box; the rest are deleted from the server. There's no way to recover deleted messages, but an activity log lets you view details of such messages, along with the reasons they were deleted.

There are three ways to create filters for blocking spam. You can create your own using Interceptor's well-designed Filters dialog box, import a batch of filters from a text file, or download sets of filters from the company's Web site (www.grok.co.uk/interceptor/filters.html). When adding your own filters, you can specify where the offending string will be found.

Interceptor doesn't offer as many filters as its competitors, nor does it include a list of known spammers. But because Grok's ready-made filters are just text files, there's really nothing that prevents you from manually entering them into your current e-mail client. Finally, Interceptor only works with one e-mail account. A 30-day, trial version is available on Grok's Web site.

Spam Buster 1.63

\$19.95 list. Contact Plus Corp., Satellite Beach, FL; 800-366-9876, 407-984-2592; www.contactplus.com.

● With a built-in database of thousands of tell-tale spam signs, the ability to work with any e-mail client and up to 12 POP3 accounts, and other useful features, Contact Plus's Spam Buster 1.63 is a powerful antidote to unsolicited e-mail. Perhaps a little too powerful. We found that its default filters often blocked legitimate e-mail. And Spam Buster's interface is a little too complex.

Spam Buster is easy to install, and the only information you need to provide is the name of your POP3 server. The main program interface has three buttons, for checking e-mail, changing settings, and exiting. The Spam Settings dialog box contains a series of seven tabs for viewing and editing different types of filters. Like most spam-filtering tools, Spam Buster can check your e-mail accounts automatically and download only the messages that meet its criteria.

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Diamond Monster Sound MX300 PCI Audio Card		Diamond Monster Sound MX300 PCI Audio Card		ESS Solo PCI Audio		Diamond Monster Sound MX300 PCI Audio Card	
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Microsoft Windows98		MS Office 2000 SBE + Windows98		Microsoft Windows98		Compaq CV715 17" Monitor (16.0" VIA)	
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1. Follow instructions on the other side

Back

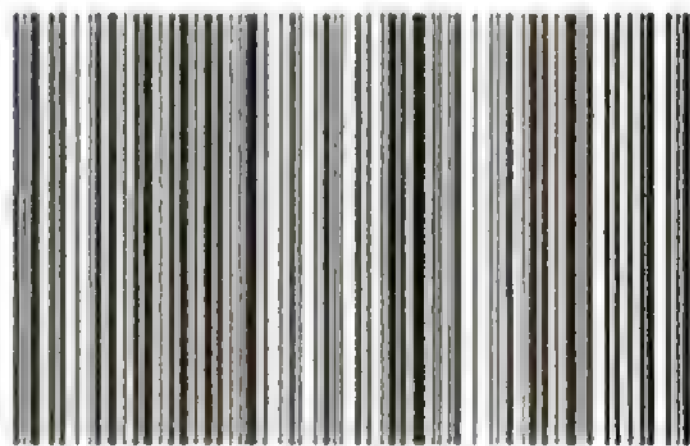
0018-0000-back-0018



Inverted Back

1. Follow instructions on the other side

Folded edge of the page



GbsSlipSheet-001

Inverted Foldout slip-sheet

Foldout slip-sheet

1. Open the foldout page

2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet



1. Open the foldout page

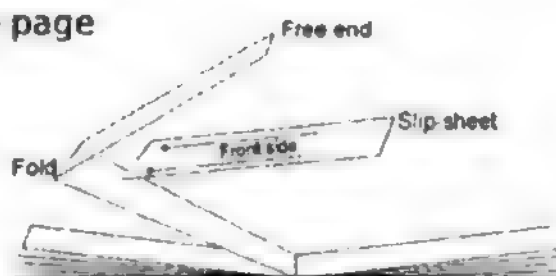
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2. Arrow pointing to the fold

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Spam Filters

	Installation and configuration	Spam filtering
eFilter Spamnet	Good	Fair
Interceptor 1.0	Good	Fair
Spam Buster 1.63	Good	Excellent
SpamEater Pro 2.7.0	Fair	Good
SpamKiller 2.60	Excellent	Excellent

By default, Spam Buster includes about 150 text-based filters (based on message subject, header, and sender) and a BlackList of almost 17,000 known spammer e-mail addresses and domain names. It also has the ability to filter messages on the basis of size. You can view, edit, and delete these filters, as well as create your own, in the Spam Settings dialog box.

While Spam Buster is quite powerful, the interface is confusing and the program can be a little too aggressive. On our tests, it blocked 17 out of 33 messages—more than any other program—and flagged another 6 as questionable. Fortunately, Spam Buster lets you view suspect e-mail before deleting it, to avoid accidentally filtering out legitimate mail.

A unique feature is a log that displays e-mail statistics (mail traffic, amount of spam deleted, top ten spammers and domains, and so on).

Spam Buster can take on the toughest spammers. We just wish it were a little easier to use.

SpamEater Pro 2.7.0

\$24.95 list. High Mountain Software, Pine, CO; www.hms.com.

● High Mountain Software's SpamEater Pro offers satisfactory protection against unsolicited e-mail and works with an unlimited number of POP3 e-mail accounts. But because SpamEater Pro savors every word in each e-mail message before deciding whether to swallow it or spit it out, we found the program exceedingly slow. Furthermore, the confusing interface makes navigating the program difficult.

Installation of SpamEater Pro went smoothly. The program gives you four options for checking e-mail: Check, Check and Eat, Qwik Check, and Check

and View Headers. The latter option, which is hidden in the Headers Listing dialog box accessible only from a pull-down menu item, is actually the most useful. With Check and View Headers, you can view the headers of unsolicited messages to determine their sources.

The program ships with a Spammers list of 15,000

e-mail addresses and text strings that typically indicate junk mail. You can augment the list by downloading new entries from High Mountain Software's Web site, and you can add your own entries by selecting the offensive text string or e-mail address in a spam message header and clicking the Add button in the Headers Listing dialog box.

The reason SpamEater Pro takes so long to check messages is that its filtering process reads the entire text of each e-mail message; most spam filters check only specific areas such as the e-mail

address and subject line. In order to speed up the checking, you can set SpamEater Pro to check only for valid e-mail addresses, but you'll give up some protection (spam comes from valid e-mail addresses as well).

SpamEater Pro works as advertised, but it makes you wait too long to receive your e-mail.

SpamKiller 2.60

\$29.95 list. Novasoft, Trondheim, Norway; www.spamkiller.com.



The most Microsoft Outlook-friendly program in this roundup, Novasoft's SpamKiller 2.60 is a powerful and effective spam-fighting tool. SpamKiller works with an unlimited number of POP3 and MAPI e-mail accounts—and any POP3 e-mail client. You can configure each account separately based on the connection type, server details, and desired schedule for checking mail.

SpamKiller installs quickly, and you

More Spam Fighters

The five products reviewed in our main story are our top choices for battling spam. But there are many options out there. Here are some others we tested

FlameThrower 1.1

\$29 list; Eagle Research Inc., San Francisco; 415-495-3131; www.xeagle.com.

Designed only for Microsoft Exchange and the Corporate or Workgroup version of Microsoft Outlook, FlameThrower uses proprietary heuristics when analyzing specific e-mail properties to filter spam effectively. You can also add to this smart filter by creating your own list of offenders.

Spam Attack Pro 2.52

\$29.95 list, Softwiz Software LLC, Woodland Hills, CA, 877-734-7638, www.softwiz.com.

Spam Attack Pro supports POP3 and MAPI e-mail accounts. Through a single-window interface, it filters a list of 1,500 known spammers. You can update the list from Spam Attack's Web site. If you want to filter with spam strings you must build them yourself, including adding from incoming messages.

Spam Hater 2.09

Free; Net Services, Surrey, UK; www.cix.co.uk/~net-services

Spam Hater works with most popular e-mail programs—even AOL 3.0, Calypso, CompuServe, Juno, Pegasus, and the newsgroup reader Free Agent. A useful way to fight back, SpamHater creates responses to send to spam offenders and generates queries to help you find the spammers and their ISPs. It is based on a set of preprogrammed filters and supports only one mailbox.

Spamicide 1.0.2

\$45 list; Net Services, Surrey, UK; www.cix.co.uk/~net-services.

Supporting only POP3 mailboxes, Spamicide filters all your e-mail and places suspect messages in a separate folder to view at your convenience. It uses a preprogrammed set of filters, as well as spammers' e-mail addresses that you add to a database. Spamicide works with only one e-mail account.

SpammerSlammer Pro 2.0

Free; Now! Internet Tools, Glendale, AZ, 602-896-2700, www.spammerslammer.com

Along with Eudora and Outlook Express, SpammerSlammer Pro supports Becky Mail, Calypso, DTS Mail, Transoft Mail Control, and, in the near future, AOL. To set up the filtering preferences, you download predefined spam rules from Now! Internet Tools' Web site.

SpamScan97

\$22.99 list; Webster Image, Middle Village, NY, www.webster-image.com

Though it has a difficult interface, SpamScan97 works with most e-mail applications except AOL, CompuServe, Lotus Notes, and Prodigy. It gives you the freedom to build a list of friendly addresses, spammer addresses, and banned domains. To prevent mail deletion mishaps, you can run SpamScan in simulation mode while you get used to the program.

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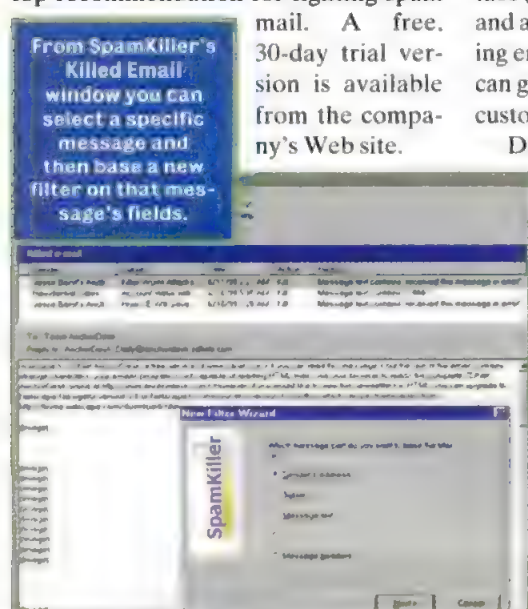
can test your mail server and e-mail program to verify that they will work with the program. Only SpammerSlammer Pro from Now! Internet Tools offered a similar feature (see the table below). SpamKiller sits in your system tray, checking your e-mail in the background based on a schedule you set. SpamKiller downloads messages into two areas: an in-box and a killed mail folder. From within SpamKiller's interface, you can easily see which e-mail messages were rejected and why.

With its vertical toolbar on the left side, SpamKiller's interface is reminiscent of Outlook. In the filters section, you can add filters by entering them manually.

SpamKiller filters according to numerous conditions such as sender, subject, message text, e-mail header (including X-Mailer and other X headers), and country code. SpamKiller will also check for invalid e-mail addresses, whether or not the sender and reply-to addresses are identical, and whether the recipient's address is really your own.

On our tests, SpamKiller performed well, flagging 7 out of 33 messages as spam—6 of which were spam messages that had been forwarded from another, valid e-mail address.

SpamKiller has the total package: It intercepts spam without being overly zealous, it does its job quickly, and it is easy to use. For these reasons, it is our top recommendation for fighting spam mail. A free, 30-day trial version is available from the company's Web site.



Keep the Keys Safe

By Edward Mendelson



Passwords are a part of life in the nineties. Just about everything—your ATM card, your house alarm, your calling card—requires a password. The PC is no exception. These days, not only must you remember the log-on code for your ISP account but also the user names and passwords for the many Web sites that require registration.

The solution to this mess is a password manager. These utilities help you recall the passwords for both Web sites and applications. Just remember the master password for the utility and you have access to all your passwords. Also, some password managers will enter passwords in the appropriate fields for you. Besides being convenient, they keep your passwords stored securely.

Many password managers are available on the Web as either freeware or shareware. For this story, we tested six shareware and commercial password managers. Think of these programs as digital key chains for your computer.

ePassword Keeper 1.0

\$19.95 list. ediSys Corp., Dallas; 214-853-5761; www.edisys.com.

● A version 1 product, ePassword Keeper from ediSys has all the basics and an intuitive interface. It lacks more advanced features, however, and suffers from a few rough edges.

Accessible from the Windows system tray, ePassword Keeper has two default tabs (passwords and credit card numbers) and an Explorer-like interface for managing entries. From the password form, you can generate random passwords based on customizable rules.

Double-click on an entry containing a Web site address and ePassword Keeper will launch your browser and enter the URL. You can copy and paste IDs and passwords, but ePassword Keeper has no hotkeys.

Password Manager 2.5

\$15 direct. Celerity Consulting Services, Montgomery, AL; www.celcoserv.com.

● Like its name, Password Manager from Celerity Consulting Services is straightforward, and it offers a lot.

At first start-up, Password Manager prompts you to create a

PASSWORD MANAGERS

master key. The entries you add appear in a spreadsheet. You can edit them directly in the spreadsheet, sort them by clicking on any header, and group them in custom tabs.

Password Manager will remind you to change your password, and you can tell the program to scramble an existing password or randomly generate a new one. You can also configure the program to obscure the password field.

An AutoKey sequence lets you quickly drop the user name and password for a selected account directly into a form. A prerelease of the next version (2.5.9) adds support for more Windows hotkeys.

Password Power 2.0

\$9 direct. WorldStart, Toledo, OH; 888-557-2558; www.worldstart.com.

● WorldStart's mid-priced Password Power 2.0 has a few unique strengths, but it is missing some basic features, and we found the interface to be more cluttered than those of the competition.

Password Power supports multiple password lists. Start typing the name of a protected application or site and Password Power automatically jumps to that entry and displays details, including two custom fields. One handy feature is a built-in backup utility.

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from **no way** to
maybe to

yes.



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Password Power can display passwords as asterisks to thwart onlookers, but the utility can't generate random passwords or remind you to change your password.

Password Safe 1.7

Free. Counterpane Systems, Minneapolis; www.counterpane.com.



Lock up your passwords securely with Counterpane System's Password Safe, the only product in this roundup that uses Blowfish, a strong encryption algorithm (448 bits). On this foundation, Password Safe builds free, comprehensive password protection.

Password Safe's main window displays a list of protected applications and user names. When you open an entry, you can view notes, instruct the program to generate a random password, or display the password. Different sets of passwords can be stored and opened, each with a default user name.

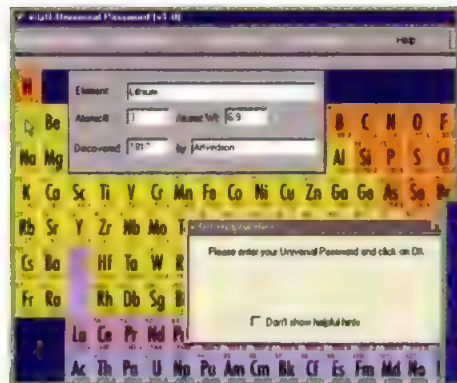
Keyboard combinations make it easy to quickly transfer user names (Ctrl-U) and passwords (Ctrl-C) to the Windows clipboard and paste them into the appropriate fields using Ctrl-V.

v-GO Universal Password Plus! v1.5

\$29.95 list. PassLogix Inc., New York; 212-825-9100; www.passlogix.com.

● With PassLogix's innovative v-GO Universal Password Plus!, a picture is worth a thousand passwords.

You enter passwords by manipulating objects such as clocks, vegetables, or playing cards in an interactive scene. When you perform the correct series of actions, the program displays or automatically



Even a chemical formula can be v-GO's visual password. Just click on the right elements to unlock.

enters the passwords to log on to Web sites or open applications or files.

Conveniently, v-GO runs in the background, automatically detecting password-protected applications and sites. You can configure v-GO to remember your password for a specified period, so you don't have to reenter it. The only drawback to v-GO's approach is that you must use the mouse to enter passwords.

The Anonymous Internet

Even if you use the tools reviewed in our main story and follow all of the tips, you'll inevitably give out some private information. To remain incognito on the Internet, you need to use an anonymous browser and a remailer.

An anonymous browsing service stands between your browser and Web sites. To use one, you visit the service and enter the URL of the site you want to view. Although slow, the service automatically blocks downloadable content such as Java and JavaScript, thereby preventing the site from capturing personal data.

There are several free anonymous browsing services, such as Alxs Net Privacy (<http://alxs.net/alxs>), and Janus (www.rewebber.de). Perhaps the best known, Anonymizer (www.anonymizer.com), offers a free service and a faster fee-based service (\$49.99 direct for one year).

Lucent Personalized Web Assistant (<http://lpwa.com:8000>) is a unique solution that preserves your anonymity while still delivering a personalized Web experience. For sites requiring registration in exchange for information, it generates fake user names, passwords, and e-mail addresses based on your "secret" (a universal password), the site you're visiting, and your real e-mail address. By the time you read this,

LPWA will be a for-fee service called ProxyMate (www.proxymate.com).

Using a different approach to hide your identity, a remailer deletes your information in the header of the e-mail message, then forwards the message to the recipient. A pseudo-anonymous remailer's host knows your identity. A truly anonymous remailer forwards messages through multiple remailers, making it impossible to trace them back to the actual sender.

Like their browsing counterparts, remailers are free but slow, taking several days to get the message to its destination. Examples of some remailers include Anonymizer (www.anonymizer.com), Send Anonymous Email (www.ozemail.com.au/~geoffk/anon/anon.html), and Replay (www.replay.com). The recipient has no way to reply to messages sent from these remailers. If you would like a reply, you can learn how to insert special commands in your e-mail (www.replay.com/remailer/chain.html).

Some might prefer to send anonymous messages via a free, Web-based e-mail account, such as those from Yahoo! Mail or Hotmail. These are easier to use, and your e-mail won't get held up for days wending its way through multiple remailers. —Angela Graven and John Morris

Whisper 32, a compact password manager that offers thorough keyboard support for fast, efficient operation.

Whisper 32's main interface is essentially a list of entries for Web sites and applications. You can display or hide passwords with a single keystroke. In the dialog box, which includes ample space for notes, you can instruct the program to randomly generate passwords for each entry according to customizable rules.

If an entry's notes include one or more URLs, you can launch these sites with hotkeys. Like Password Safe, Whisper 32 uses standard hotkeys (Ctrl-U and Ctrl-C) to copy user names and passwords.

Whisper 32

Free. Shaun Ivory; www.ivory.org.

● Programmer Shaun Ivory took the no-frills approach for his free

Yes starts here.

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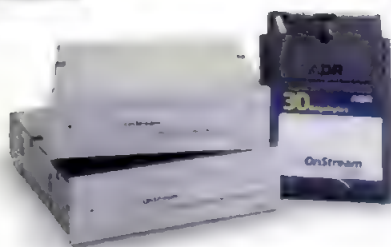
- 512MB ECC SDRAM
- 9.1GB Ultra2 SCSI hard drive—10,000RPM
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30 Tips to PROTECT You and Your Business

You don't have to give up your day job to defend yourself or your company. But you do have to take the right steps to head off trouble. You know that there are risks out there on the Internet—risks to your personal security and privacy and to your business. But in this Internet age who has the time to obsess over security?

That's why we've assembled a cheat sheet packed with quick tips to help you get started protecting yourself, your business, and your Web site. Inside, you'll find an illustrated guide to configuring the safety features in your Web browser and step-by-step solutions to spam, plus advice about passwords, newsgroup postings, and much more. We've also pulled together two lists that inform you on how to protect your business and secure your Web site.



>>> OPEN

Our Contributors:

Ben Z. Gottesman, John Morris, Robert P. Lipschutz, Sarah L. Roberts-Witt, Jeffrey Witt, Kevin Young.

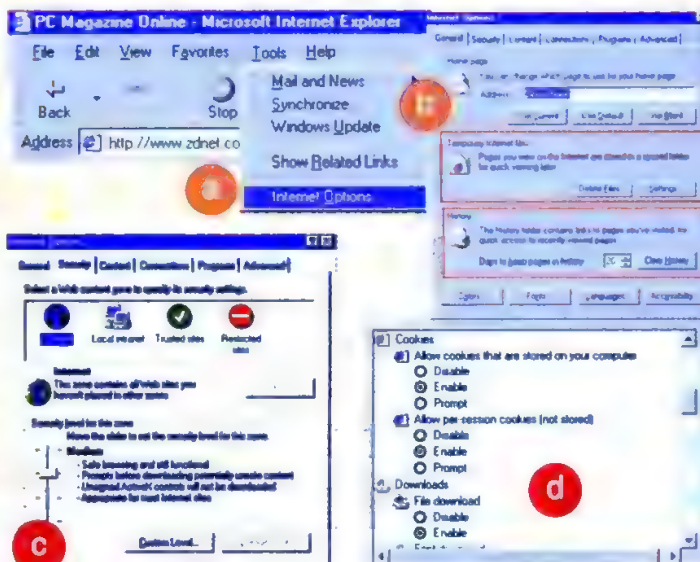


10 Tips To Prote

- 1. Configure Your Browser.** You may not know this, but the Web browser you're already using has many built-in safety features. It's time to start making use of them. Here is how to configure these features using Microsoft Internet Explorer 5.0 and Netscape Communicator 4.6.



- a) All of IE's Security settings are kept in a single, tabbed dialog box accessible from the Tools menu.
- b) From the General tab, you can delete the temporary files stored on your PC and the history that is maintained as you travel around the Web. If you want to prevent your browser from hanging onto files, reduce the size of the cache (the space on your hard disk reserved for temporary files) and the number of days that IE preserves the history.
- c) The Security tab lets you assign security settings to different zones, including the Internet and an intranet. You can also create lists of sites that you trust and restricted sites that demand greater scrutiny.
- d) To fine-tune security settings for all sites or individual zones, click on the Custom Level dialog box. There you can instruct IE on how to deal with all active content, including ActiveX controls, Java applets, scripts, and cookies. Some of these options are also available under the Advanced tab.



- 2. Approach attachments with caution.** Open an e-mail attachment only when you know who sent it and what it contains. E-mail is one of the fastest and easiest ways to spread viruses, worms, and Trojan horses. The recent ExploreZip underscored the dangers. This virus comes in the form of an innocent-looking e-mail message, typically from someone you know, with an attachment named Zipped_files.exe. When launched, the worm proceeds to delete files on your hard disk and the network. The lesson: Even if an attachment looks legit, check it out with an antivirus program before you open it.



- 3. Use passwords effectively.** A BIOS password is best, because it prevents unauthorized users from rebooting to gain access to your files. But you can also set passwords in Windows or your screen saver. Make sure your passwords are at least eight characters long and consist of both letters and numerals. Avoid using obvious passwords such as anniversaries, birth dates, children's names, or phone numbers. Change passwords once a month, and never give them to anyone.

- 4. Use multiple screen names for different tasks.** Many major ISPs let you create up to six different screen names, each with its own e-mail address. If you create a separate screen name for Web browsing and posting to newsgroups, you can cut down on spam mail that would flood your personal or business in-box.

- 5. Opt out of marketing databases.** Many organizations, including credit bureaus, motor vehicles departments, and direct marketers let you choose not to have information shared with marketers. For instructions and sample opt-out letters, see the Federal Trade Commission's Privacy site at www.ftc.gov/privacy.

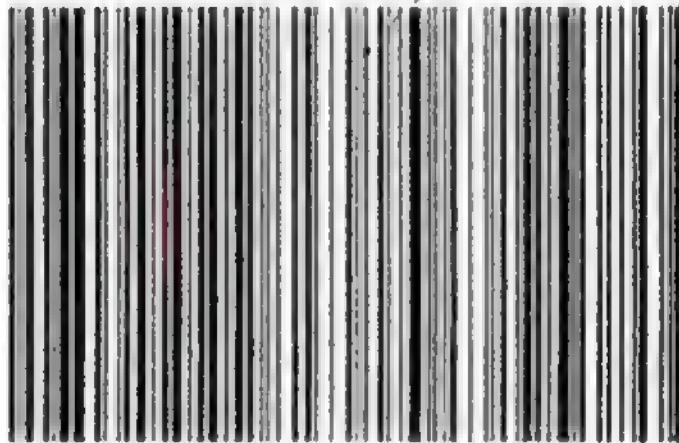
- 6. Keep your antivirus program up to date.** About 300 new computer viruses appear each month. Although only a small portion of those make it into the wild, incidents such as CIH, ExploreZip, and Melissa demonstrate that the risks of virus infection are clearly growing. Most antivirus companies post updates within days of new attacks. To detect the new viruses and disinfect your system, you must update your antivirus program once a month and whenever a major threat occurs.

- 7. Nuke newsgroup messages.** Newsgroup postings are fertile ground for spammers. To remove messages you posted from Deja.com's archive, just fill out the Article Nuke Form at www.deja.com/forms/nuke.shtml. Note that this removes your posting only from Deja.com, not from Usenet. To prevent new postings from being archived, use the X-no-archive option supported by the Deja.com X-header field and some Web browsers. (In the X-header field, type "X-no-archive: yes"). If you are not posting through Deja.com, or if your browser does not support X-headers, then you can still employ the X-no-archive option by

1. Follow instructions on the other side

Back

GB51PBACK-001B



Inverted Back

1. Follow instructions on the other side

Folded edge of the page



Inverted Foldout slip-sheet

Foldout slip-sheet

1. Open the foldout page

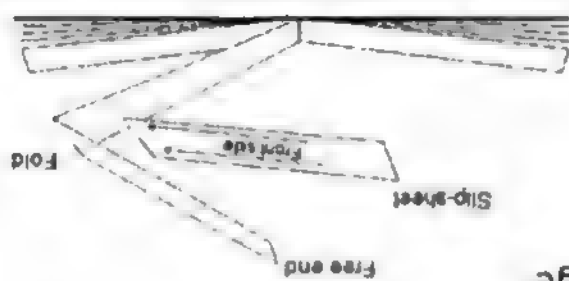
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet



1. Open the foldout page

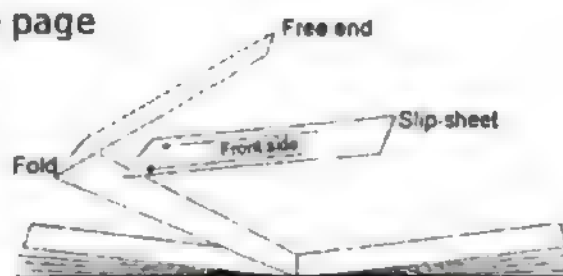
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet



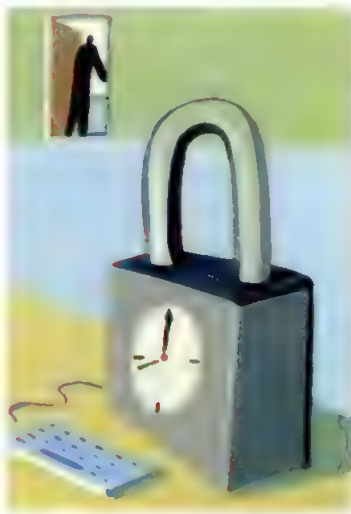
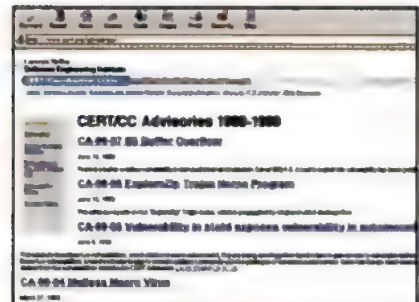
10 Tips To Protect Your Business

1. Perform a security assessment. You need to be aware of the areas where your business is vulnerable. Identify what you are trying to protect, and determine what the impact would be on your company's ability to do business if that information is lost. Have an independent party challenge your current security; your internal staff isn't the best judge of your business's potential pitfalls. You'll want to conduct a security audit/network assessment of this type at least twice a year to determine how software and hardware additions and changes have affected security.

2. Create a security policy. Assess the risks and benefits of creating a permissive or restrictive policy. Expect to be attacked both from outside and from within. Your policy should cover not only what's in place today but also how you'll deal with the addition of new computers, account creation and removal, password choices and changes, user behavior, and regular audits. Have a contingency plan in place for your worst-case scenario, and then work to make sure that it doesn't happen.

3. Don't forget physical access. Lock your servers, routers, and switches in a restricted room. Anyone with physical access can wreak havoc with your network.

4. Keep up to date. Subscribe to security advisory mailing lists. Implement a procedure for getting updates, bug fixes, and the latest patches.



5. Lock down the server operating systems. Disable any unneeded services, and make sure administrator passwords aren't static. Make sure that your remote management sessions across the network are encrypted. Turn off unnecessary services, and remove former employees' accounts quickly. Audit network user accounts regularly to make sure they aren't unnecessarily or incorrectly changed.

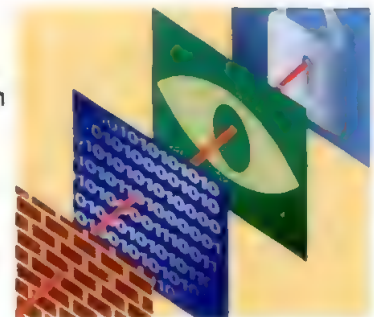
6. Restrict network access. Create day and time restrictions for employees who do not need around-the-clock availability, because doing so leaves your network less open. Don't make Internet access a default for systems (such as HR application servers) that don't need access.

7. Protect your logs. Without protected records of what's happening, you won't know when you've been compromised, and you'll have little recourse against those who do you harm. Capture audit logs in real time from your operating system, database, middleware, and applications to a centralized location for safekeeping. Always maintain a strong backup strategy for both data and security logs.

8. Dig multiple trenches. Take a layered approach to security. Move away from thinking that you're secure with a firewall and basic network security. This means using host- and network-based intrusion detection, application security schemes, and file encryption in addition to firewalls. This approach will give you much better security around your network, OSs, desktops, applications, and databases.

9. Stay in touch. Make sure to set alarms so you'll be notified immediately when something unusual happens in your network. Use multiple notification methods such as network messages, e-mail, and pager messages to stay up to date.

10. Foster in-house security expertise. Or consider farming out the duties. You can't expect to become an expert overnight; so if you don't have the talent within your company, you're going to need assistance. Routing and DNS issues are complicated; each has its own nuances, and you need someone who understands the current hazards. Create a small corps of in-house people devoted to security issues or make plans to outsource your security needs.

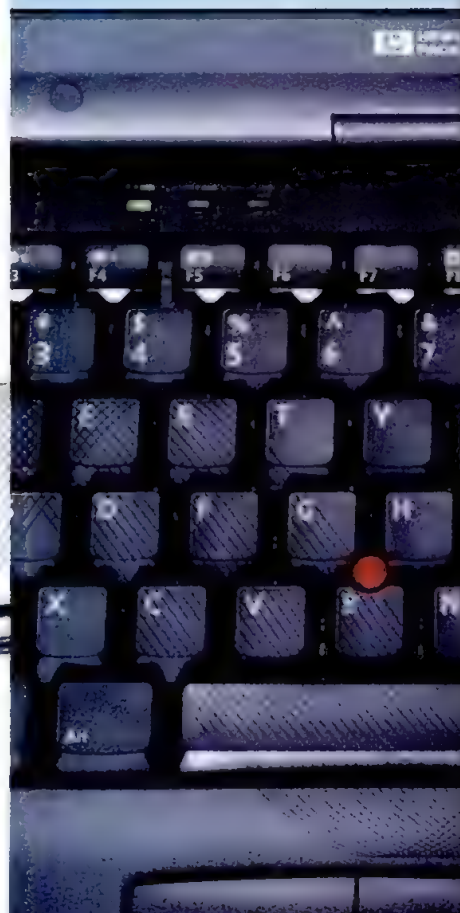


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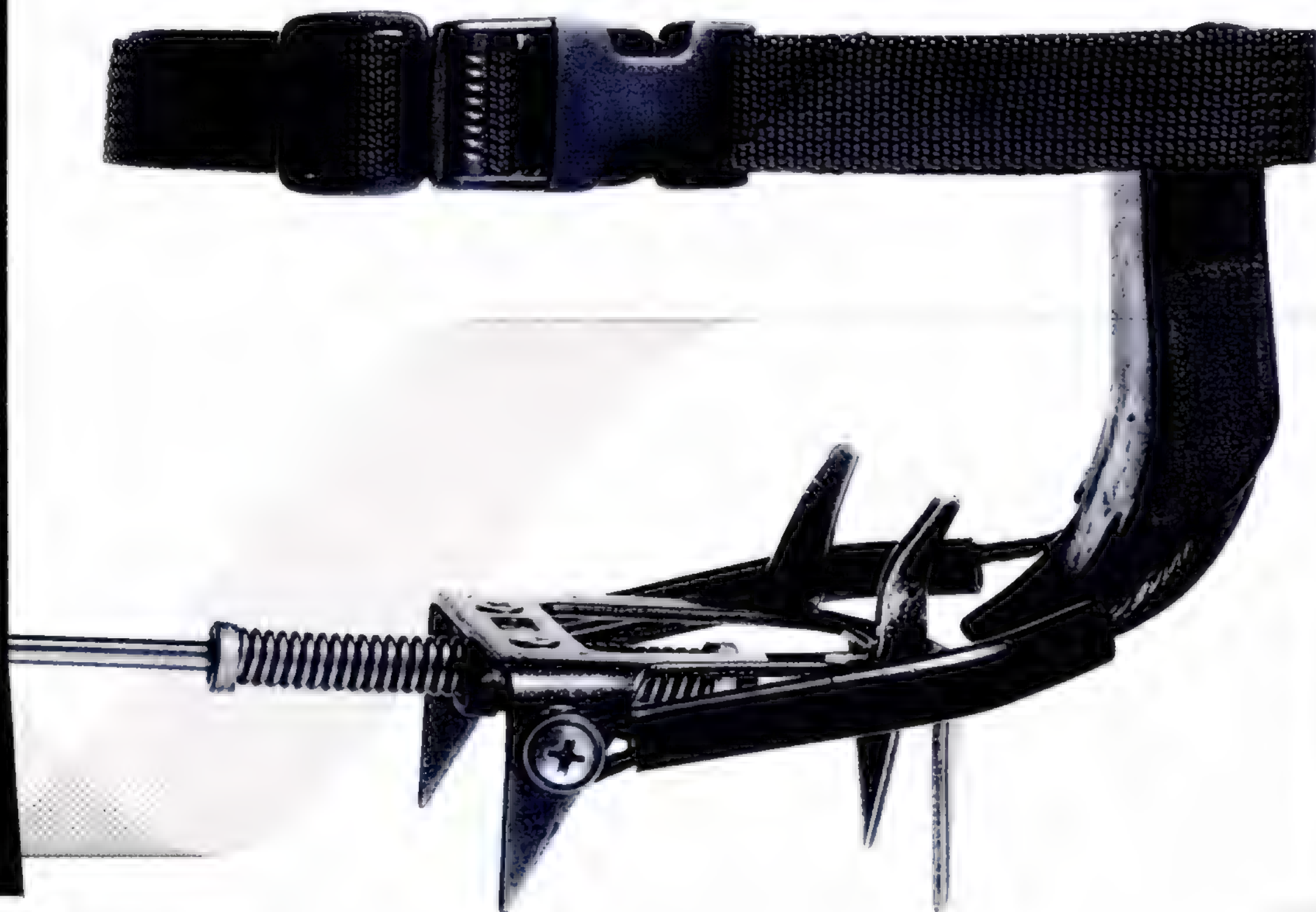
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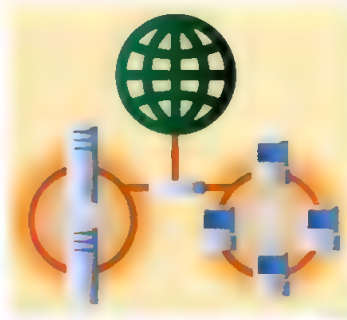
10 Tips To Protect Your Web Site

1. Build a wall. If you haven't yet installed a firewall to protect the Web servers running your site, do so immediately. This is the first line of defense against hackers hoping to make mischief.

2. Separate the public and the private. Make sure that the Web servers running your public Web site are physically separate and individually protected from your internal corporate network. If someone were to hack into your Web site, you'd want to prevent that person from having a point of entry into your corporation's sensitive data.

3. Do it right the first time. ICSA (www.icsa.net) reports that 70 percent of sites with certified commercial firewalls are still vulnerable to attacks because of misconfiguration and improper deployment. A poorly configured firewall doesn't do much good. In addition, Web, e-mail, FTP, and news servers all have known holes (old versions, misconfigurations, incorrect privileges, and so on), which you need to take into account. This is why you need experts helping you every step of the way.

4. Poke holes before the bad guys do. Use scanning tools to determine the potential vulnerabilities associated with all of your systems that are Internet accessible.



5. Watch traffic like a hawk. Put host-based intrusion-detection agents on your Web servers, and monitor activity, looking for any irregularities.

6. Issue licenses to buy. If you're conducting e-commerce on your Web site, secure your transactions with digital certificates.

7. Develop Web content off-line. Set up a staging area internally where relatively important data is held and reviewed before being posted to your Web site. Make this area password-protected and enforce the password component.

8. Protect your database. If your Web site serves up dynamic content from a database, consider putting that database behind a second interface on your firewall, with tighter access rules than the interface to your Web server.

9. Don't forget your trading partners. If you have an extranet site for dealing with your business partners, create extra security for it, because you are communicating across the Internet, and you're only as strong as the weakest link. Deploy a VPN for secure connectivity. Ask your trading partners to do all that you are doing in terms of security. Setting up an extranet with trading partners or resellers opens up a whole world of vulnerabilities. Your partners need to put firewalls in place, conduct security audits, and so on, just as you are doing.

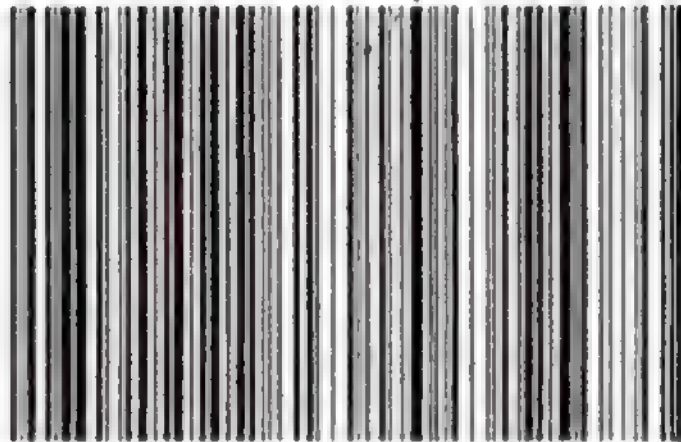
10. Harden your Web server. If you're extremely security-conscious, consider a "hardened" Web server product, which comes with a locked-down OS and a compartmentalized networking subsystem.



1. Follow instructions on the other side

Back

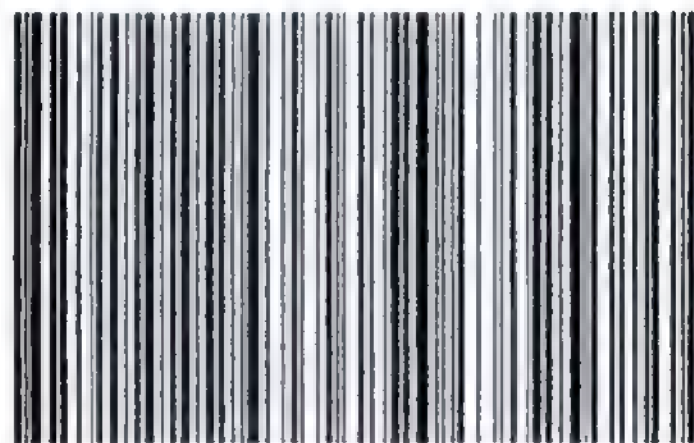
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Inverted Back

1. Follow instructions on the other side

Folded edge of the page



Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page

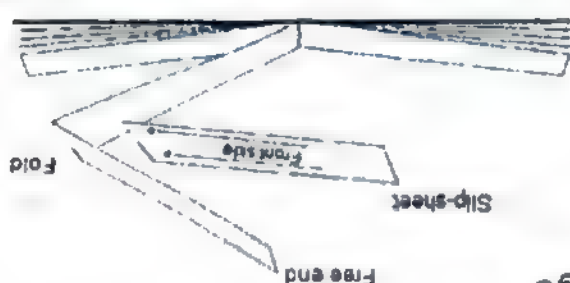
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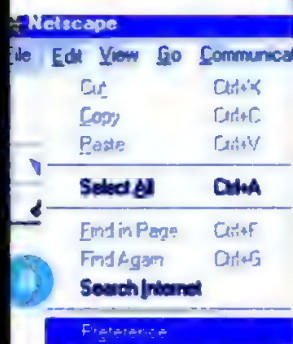
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3. Slice the folded edge

4. Close the page and slip-sheet



Protect Yourself Online



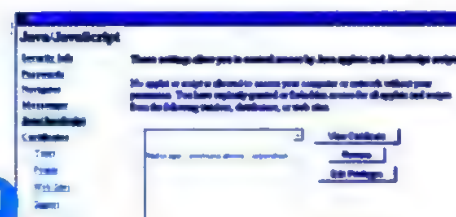
b Navigator, the browser in the Communicator suite, stores security settings in two locations—under Preferences and under Tools on Communicator's pull-down menu.

c From the Preferences dialog box, you can access the settings for temporary files such as history. As in IE, you can clear the current history file and set the number of days you want the browser to save your history. You can also delete the entries that appear under the pull-down address bar where you enter URLs.



c Most of the security settings can be found in the Security Info dialog box. Click on Navigator to view settings for the browser, especially how it handles encrypted data.

d The Java/JavaScript window lets you specify which sites are permitted to send you active content based on their certificates, which verify the sources.



8. Update your OS and browser. Microsoft and Netscape are constantly posting updates and patches for security holes in the respective OSs, browsers, and e-mail clients. Both offer update services (<http://windowsupdate.microsoft.com> and <http://home.netscape.com/smartupdate>) that will notify you when new fixes are available and manage the process of downloading and installing them.

9. Stop Spam Mail. Unsolicited junk e-mail is a growing problem on the Internet. If your in-box has become flooded with spam, here's a step-by-step to help you clean it up.

- **Don't reply to spam,** even if the message offers to remove you from its list. This is just a ploy to find out whether your e-mail address is active.
- **Find out where the spam originated.** Unfortunately, most spammers use phony e-mail addresses. But with a little digging, you can determine the domain and perhaps even the e-mail address by examining the message's header. Most e-mail clients hide the header information by default, so you'll probably have to adjust some settings to show it. Look for the domain name, such as Spammer.net.
- **Go to the Network Solutions Registration Services database,** better known as Whois, at www.networksolutions.com/cgi-bin/whois/whois and enter the domain name. The database should provide details, including the postal address for that domain.
- **Write a complaint to the Internet service provider** if Whois doesn't yield a name or address. Most domains have a default address for complaints (abuse@domainname.com) that you can try. Large ISPs may have different addresses. For example, AOL subscribers can forward junk e-mail to TOSSMAIL.
- **Notify your ISP.** Most ISPs have server-based filters designed to block spam before it ever reaches you. In addition, ISPs such as AOL have taken legal action to try to stop the worst offenders.
- **Create a filter using your own e-mail client** or one of the add-on products reviewed in our main story, so you don't have to worry about getting e-mail from the same source again.

10. Stick with sites you trust. About two-thirds of commercial Web sites now post their privacy policies, according to a recent Federal Trade Commission study. Before volunteering any information, make sure you know the site's policy. Look for sites that have been certified by a service such as BBBOnline or TRUSTe. Before making any purchases online, look for the graphical icon on your browser that indicates you are using a secure server. Note the URL, address, and phone number of the business, and print out a copy of your order and confirmation number, in case you need to contact the company.





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Protect *your* Business

Corporate security used to mean locking the doors and getting a guard. Find out what you need to make your company safe in the Internet era.

By Sarah L. Roberts-Witt

A business in the Internet era needs to protect its sensitive internal files as well as the files and security of its employees, customers, and suppliers. Achieving this aim is difficult, because it creates contradictory goals: Your company's Internet infrastructure needs to be closed—to padlock vital corporate data assets—but it also needs to be open—to let e-business partners and even online consumers have access.

Making this delicate balance work starts with the outer bounds of your corporate network, known as the network perimeter, where connection points to the Internet occur. You need to safeguard your perimeter not only from unexpected outside attacks but also from internal security breaches. A three-pronged toolkit that contains firewalls, intrusion detection systems, and vulnerability scanners will get you started.

Firewalls, which serve as Internet and intranet traffic cops, are the first step in your perimeter protection. Based on rules you define, a firewall determines whether a particular user or type of traffic should be allowed into or out of your network. You need one of these wherever you have a connection to the Internet, as well as on portions of your intranet where particularly sensitive data is stored.

Network- and host-based intrusion detection systems help identify potential attacks. Network-based intrusion detection products sit just inside a company's Internet connection and compare incoming traffic patterns against sets of predefined patterns that could harm your network. Host-based intrusion detection systems watch for such things as aborted log-ons, attempts at unauthorized password changes, and dramatic changes in system resources. When violations occur, the programs then take action.

Making sure that your security strategy makes sense and is being kept current over time involves finding the weakest points of your network. This is where **vulnerability scanners** come into play. These products assess and report on the security holes in a range of applications, including firewalls, so that you can plug them up. They are also the products you use on an ongoing basis to determine when new and perhaps undesirable services, such as unauthorized FTP sites, are put up by well-meaning but security-oblivious users.

All of these products are key ingredients in your security medicine kit, but no one of them is a panacea. Solid security requires human intervention, and lots of it. So if you don't have enough in-house expertise or resources, consider outsourcing.



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FIREWALLS



Guard Your Perimeter

By Robert P. Lipschutz

The gates of the freewheeling Internet are firewalls. They are used primarily to protect your internal server and desktop resources from outside intruders; they can also be used to protect what runs your public Web site. For example, you'll want to limit visitors to accessing only Web pages at your company's site. This means putting the site behind the firewall and connecting it in a special area not directly joined to your network. Without a firewall, someone could use your Web site as a gateway into your company's internal files.

We discuss two primary techniques that a firewall can use to filter content: *application proxies* and *stateful inspection*. Both use rules to allow or deny traffic passing through the firewall. Application proxies serve as middlemen, accepting certain connections and then forwarding them; a stateful-inspection firewall checks the data packets as they pass through.

FireWall-1, Version 4.0

100 nodes, \$7,995 list; unlimited nodes, \$18,990. Check Point Software Technologies Ltd., Redwood City, CA: 650-628-2000; www.checkpoint.com.



No matter how sophisticated or complete a firewall product is, it can be an effective tool only if users clearly understand how to configure and maintain a secure rule base.

FireWall-1 is the strongest product in this area, gaining our confidence that administrators will know exactly what, when, and to whom they are granting access. It also has an underlying

sophistication and network service support that matches or exceeds that of other products in this roundup. FireWall-1's maturity also shows in its clean and powerful management interface, rounding out its offering and making it an excellent choice for protecting your network.

The clarity of FireWall-1's management interface is an advantage whether you are administering a single firewall or multiple firewalls throughout your company. The security policy interface clearly displays all rules on all firewalls in table format. In fact, you can observe almost all of your rules from a single window, a notable and convenient feature.

FireWall-1's logging features are standouts as well. Tracking can be turned on or off for each rule, and the reporting interface is color-coded and includes a filtering utility to find just the entries you want.

No other firewall offers a true single point of management for multiple firewalls (although Gauntlet's next version promises to include this feature). Where the other products in the roundup require a separate log-on to each remote firewall, FireWall-1 uses a single set of rules with a field indicating which firewalls to install the rules on. This saves administrators time and ensures consistent security throughout the network.

FireWall-1 does have a couple of small glitches. Installation enables traceroute, which lets users gather network architecture information by default (we suggest that it be disabled by default). Also, we were able to ascertain the underlying operating system of the firewall using our vulnerability scanning software. Although these are not major problems, you don't want to give hackers any advantage, and this information could give a hacker a lead as to what type of attack to launch against your network.

Although FireWall-1 has long been the champion of stateful inspection, its architecture has begun to incorporate aspects of proxy-based products. In cases where scanning a packet's data field is necessary, FireWall-1 passes the packets to a Content Security Server, which basically acts as a proxy. By using stateful inspection and proxies in concert, FireWall-1 can take advantage of the former's speed and the latter's security. Of course, other ven-

Editors' Choice



Your business needs to be on the Internet, but you need to protect yourself, too. These top-notch firewall and intrusion detection products will get you started.

• FireWall-1, Version 4.0

The best combination of functionality and ease of use makes Check Point's FireWall-1 the choice for implementing the core element of your corporation's protection scheme. No other product offers as clean an interface for managing your firewall or even multiple firewalls across your network. You can observe almost all of your rules from a single window, something that most other products make you do in a collage of open screens.

FireWall-1 also offers a winning mix of stateful inspection and application proxy architectures to offer more complete screening on both sides of the firewall. By adopting this approach, FireWall-1 can take advantage of the speed of the former and the security of the latter.

• NetProwler 3.0, Intruder Alert 3.0

Axent's duo of NetProwler 3.0 and Intruder Alert 3.0 for host- and network-based intrusion detection stands out for its powerful array of tools to protect your company from attempted chicanery. Cross-platform support lets you deploy the duo across a heterogeneous network; the product also profiles your operating systems so that they don't waste resources looking for attacks that aren't specific to them.

In case attacks do take place, the package gives you the unique ability to set different responses for high-, medium-, and low-priority attacks. Your options as to the actions an attack might trigger are broad and deep, ranging from sending e-mail alerts to cutting off user accounts or shutting down the network.

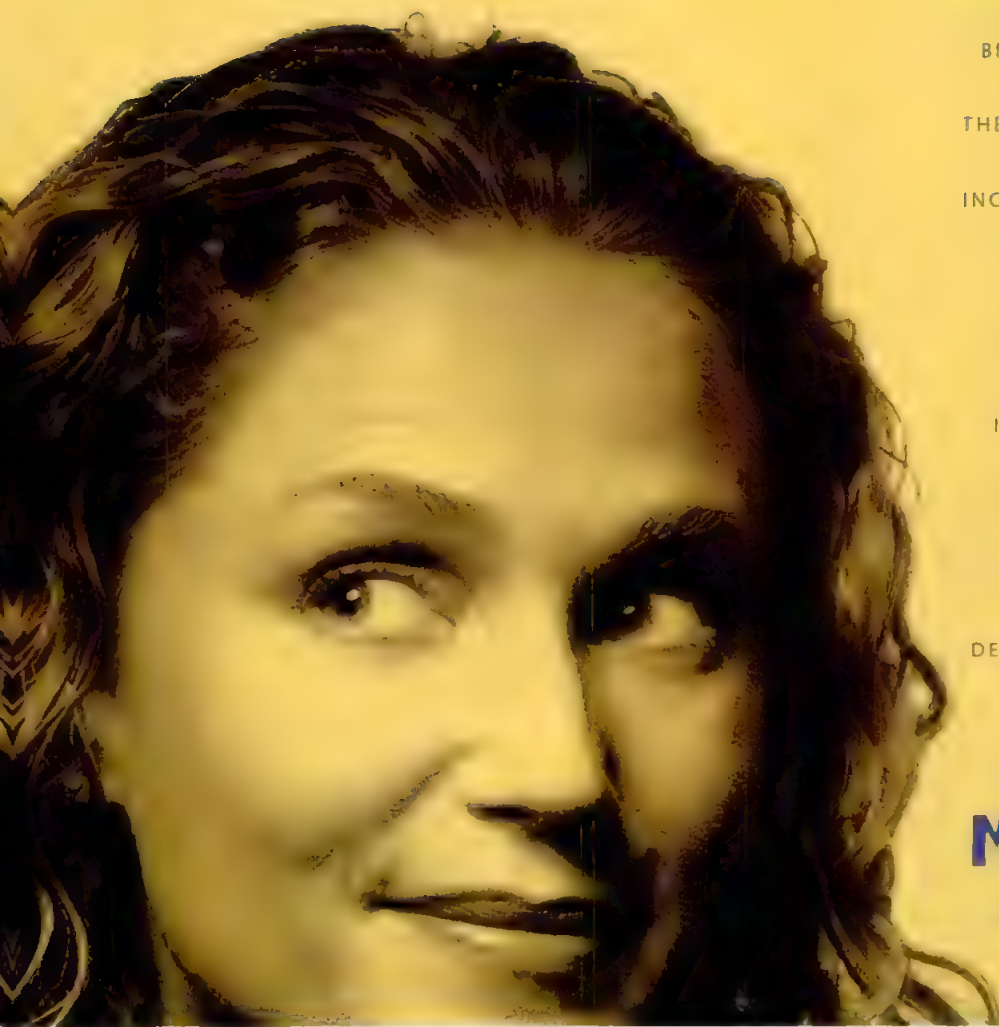
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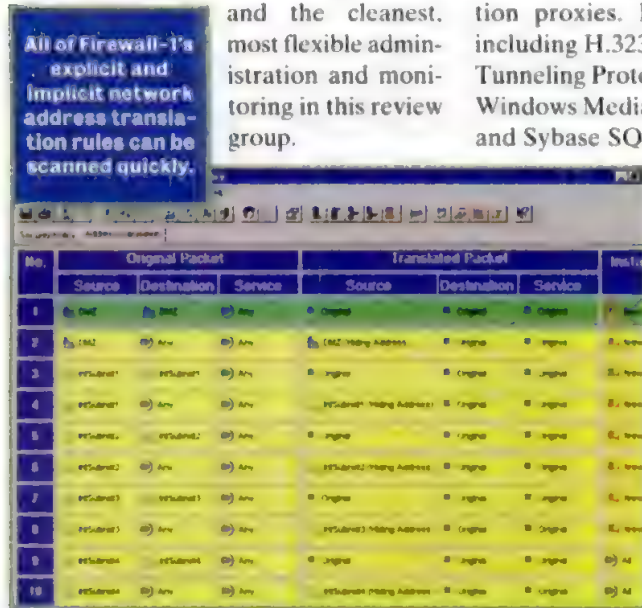
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dors in this roundup are also blurring the line between proxies and packet filtering (Gauntlet's Adaptive FTP proxy, for example), but FireWall-1 is in the driver's seat to take advantage of both.

FireWall-1 provides strong security and the cleanest, most flexible administration and monitoring in this review group.



Gauntlet, Version 5.0

For firewall with 100 internal IP addresses, \$4,000 list; unlimited addresses, \$16,000. Network Associates Inc., Santa Clara, CA; 408-988-3832; www.nai.com.

● Gauntlet, Network Associates' firewall solution, is effective, but its clumsy, tab-based Windows NT management interface (soon to be revamped) and configuration quirks hold it back from being top-notch. The Solaris version was easier to navigate and, in fact, more Windows-like than the Win NT version.

Configuring Gauntlet is done slightly differently from other products in this roundup. Rather than setting up rules in a manner that parallels router access-control lists, as FireWall-1 and Sidewinder do, Gauntlet uses a set of policies and policy maps to create its firewall rules. Each policy includes a set of proxies that are permitted and denied by that policy and an option as to whether authentication is required for access.

We found this a little cumbersome in the Windows NT version. We would have preferred creating groups of source addresses and then mapping each group

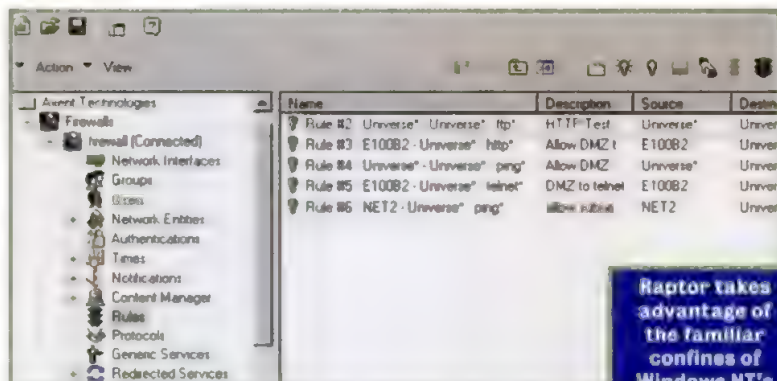
to a policy; this would have eased the process of handling a related set of people that might not have a contiguous set of IP addresses.

Like the Raptor and Sidewinder firewalls, Gauntlet primarily uses application proxies. It has a complete set, including H.323, LDAP, Point-to-Point Tunneling Protocol (PPTP), RealAudio, Windows Media, and Microsoft, Oracle, and Sybase SQL. The SQL proxies are useful for those companies with dynamic database-driven Web sites, where the Web servers are in a demilitarized zone but your databases reside within your network.

In general, Gauntlet's management, reporting, and alert features are merely adequate. Remote management of your

Windows NT-installed firewall is not done automatically over a secure link. The Solaris and HP-UX platforms support secure management, as will Version 6.0 of the Windows NT product. Gauntlet 6.0 will also include the ability to manage multiple firewalls on multiple OSs through one console; the manager for NT will be able to manage HP-UX, NT, and Solaris versions of Gauntlet.

The daily and weekly reports you can generate aren't much more than lists of



log entries, and you can't sort or filter the information without a third-party product. And alerts aren't nearly as granular or flexible as those in Raptor. For example, you can't set alerts for a specific service proxy such as HTTP.

Raptor for Windows NT, Version 6.0

With VPN: 100 users, \$6,500 list; unlimited users, \$15,000. Axent Technologies Inc., Rockville, MD; 301-258-5043; www.axent.com.

● A vastly improved management interface and the inclusion of some additional proxies enhance the usability of the latest version of Raptor, whose fundamental strengths from its application proxy architecture remain. Check Point's FireWall-1, however, offers more powerful management options as well as elements that Raptor lacks, such as single log-on and logging features.

Raptor does more content scanning out of the box than any product in this roundup. Operating at the application layer, Raptor can delve into the data portion of e-mail messages, Web requests, and FTP to maintain granular control over what does and doesn't pass into and out of your network. For example, you can prevent an internal user from browsing to specific Web addresses or from using Java applets. You can allow FTP downloads (gets) while denying FTP uploads (puts), and you can check inbound e-mail messages to see whether they originate from known spammers.

One drawback of Raptor's proxy architecture is that each new application requires a new proxy. Raptor covers common services such as DNS, FTP, HTTP, and SMTP; the recent addition of Ping (unique in this roundup) and H.323 helps round out the offering. The advantage of having a

wider range of proxies available is that you don't have to let any traffic from the Internet into your network if you have the corresponding proxy, thus making your network safer. But UDP-based applications, such as streaming audio and voice-over IP, are a problem for an application proxy firewall.

Raptor's management console has been integrated into the Microsoft Management Console (MMC). Raptor is the only product in this roundup to have this,

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Firewalls

EDITOR'S CHOICE

Basic services

FireWall-1,
Version 4.0

Excellent

Gauntlet,
Version 5.0

Good

Raptor for
Windows NT,
Version 6.0

Good

Sidewinder
Security Server,
Version 4.1

Excellent

Advanced services*

Good

Excellent

Good

Good

Management

Excellent

Fair**/Good†

Good

Fair

Reporting/logging

Good

Fair

Fair

Fair

* Advanced services refers to such features as how well the product handles special cases such as custom applications and sophisticated authentication.

† Security options, scanning for Java and ActiveX, and options for third-party programs that allow for URL filtering or virus scanning.

** For the Microsoft Windows NT version. † For the Solaris version.

and the current version is a vast upgrade from previous ones. Security administrators can manage remote firewalls from a single management station but must log on to each firewall separately, unlike in FireWall-1, which lets you log on with a single password.

You can capture a wide variety of message types to Raptor's log files, including standard informational messages such as the number of packets sent and received by the firewall and alert messages describing potential attacks. A filtering screen helps separate out pertinent messages when diagnosing a problem. But the

absence of a sorting feature made scanning through log files cumbersome.

Raptor has come a long way in its usability and provides a very solid application proxy-based firewall, but FireWall-1 shines brighter because of its superior management capabilities.

Sidewinder Security Server, Version 4.1

Without VPN: 100 nodes, \$6,900 list; unlimited nodes, \$19,900; VPN, \$3,000 per server. Secure Computing Inc., San Jose, CA; 800-379-4944; www.securecomputing.com.

● Clearly aimed at the high-security market where experts are ready and able to

configure a firewall, Sidewinder Security Server, Version 4.1 includes granular control over common services such as DNS, FTP, and SMTP mail, as well as advanced features like an X.500 proxy. The catch is that Sidewinder is more difficult to use than the other firewalls reviewed here, especially for those without Unix experience. The product is built on top of Secure Computing's own custom version of BSD Unix, which provides additional power—but at the cost of usability.

Sidewinder secures each and every service on the firewall so that no unknowns exist. Through what it calls *type enforcement*, Sidewinder separates the services from one another so that an attack on one will never give entry to another. For example, if a hacker tries to overrun the machine buffer with an attack on the SMTP mail proxy, he still won't be able to get telnet access.

You have fine-grain control over implementing your security policy because of Sidewinder's deep understanding of services. Sidewinder has proxies for standard services such as FTP,

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- Traffic Control
- IP Address Management
- OPSEC Alliance
- Integrated Policy Management

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HTTP, and telnet but also includes Oracle SQL*Net and RealAudio proxies. The firewall includes two separate DNS servers for internal and external servers. Mail filters can be set up to look at subject name, recipient, sender, or any message text to identify potentially harmful messages, such as those containing the ExploreZip virus, or annoying ones from known spammers that clog network traffic.

You manage your Sidewinder firewall through a command line interface or through a visual editor called COBRA. We found the visual interface unsatisfying because of its disjointed nature, and Unix experts are going to use the command line anyway, especially for advanced configuration. You can configure your firewall remotely through a secured telnet session (which requires using the VPN client) or through an X Window session using the COBRA tools.

Sidewinder is an industrial-strength firewall that hasn't been prettied up for the masses. But if you've got the in-house Unix expertise to manage it, Sidewinder could be just the right product for a security-conscious company.

INTRUSION DETECTION

Patrol Network Traffic

By Sarah L. Roberts-Witt



The watchful eyes of your business's security plan are network- and host-based intrusion detection systems. Sitting at connection points between the corporate network and the Internet and at individual servers, they monitor network traffic and server activity, respectively. Each can identify attacks or irregular behavior and can respond based on rules you've established.

To test the network angle, we ran new and old versions of what's known as a denial-of-service attack, which overwhelms your network to the point where it can no longer respond. As we expected, the products didn't detect the more recent varieties, but they also had trouble with established ones that they should have caught, showing the market's immaturity. For our host-based tests, the products successfully nabbed all of our tampering attempts.

NetProwler 3.0 and Intruder Alert 3.0

NetProwler, \$7,995 list; Intruder Alert manager, \$1,995; server agent, \$995. Axent Technologies Inc., Rockville, MD; 301-258-5043; www.axent.com.



Impressive for both the breadth and flexibility that NetProwler and Intruder Alert offer, the combination of the two products effectively scans your company's computers to learn what you've got running and where, then puts the appropriate defense system into effect. The integra-

Outsourcing: Rent a Cop

Corporate security challenges are huge, and the number of people qualified to deal with them is tiny. Hence the tremendous surge in security outsourcing, a market that Infonetics Research (www.infonetics.com) predicts will nearly triple within the next year—from \$229 million to \$716 million. A number of players are currently jockeying for dominance, from behemoths like IBM to independent agents like NetSolve.

With 450 people devoted exclusively to security, IBM Global Services (800-426-4968, www.ibm.com) is a force to be reckoned with. In addition to a wide range of consulting, assessment, and ethical-hacking services (*ethical hacking* implies that you hire hackers to find vulnerabilities in your network), IBM offers managed firewall and intrusion detection packages.

Another component of its service portfolio is the Internet Emergency Response Service. Though the price tag looks steep at \$37,000 per year, this service provides on-the-spot protection and recovery during and after a hack, alleviating your need for having someone on call in the middle of the night, when most hacks occur.

GTE Internetworking (800-472-4565, www.gte.com) specif-

cally targets the country's 3.2 million small to midsize businesses with its Security Advantage package. Starting at \$795 per month, this turnkey service includes firewalling courtesy of the WatchGuard product line, 24-hour monitoring and response, product management and maintenance, and monthly reports.

You don't have to go with a major telecommunications company to get security outsourcing. A startup, NetSolve (512-340-3000, www.netsolve.com) is also gunning for midsize businesses. Its ProWatch Secure Services use Cisco's PIX firewall and NetRanger intrusion detection products, which the customer has to buy; the services include both managed firewall and intrusion detection and response services. These run \$1,295 and \$1,495 per month; a combo package costs \$1,995 a month.

Pilot Network Services (510-433-7800, www.pilot.net) takes a different approach by constructing its own security infrastructure, through which it hosts and monitors its clients' networks. The company's Secure Access and Gateways service, which provides fortified e-mail, secure Web services, and secure FTP/telnet gateways, starts at \$5,000 a month. —SLRW



Managing
a network
is full
of surprises.
When you
see something
different.
When you
learn something
new.
When your

expectations are thrown a

curve



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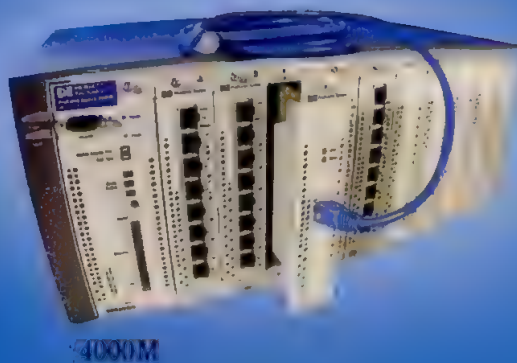
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HP ProCurve Switch 9300M, 4000M and 2424M prices are U.S. list prices effective June 8, 1999. Savings claims based on U.S. list prices effective June 8, 1999 for Cisco 2924M-XL, Bay Networks 450T, 3Com SuperStack II 3300 in a large network. Market growth source: Dell'Oro Group, May 1999. HP ProCurve 9300 series products have a 1-year warranty with extensions available. ©Hewlett-Packard Company

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tion of the products is still something of a kludge, but their power makes them stand out over RealSecure.

After installation, you use NetProwler's profiler feature to complete deployment. The profiler scanned the systems in our network to determine what operating systems and services were running, then automatically enabled the attack signatures that made the most sense. For example, the product didn't watch for WinNuke attacks, which are Windows-specific, destined for our Sun Solaris box.

We had the profiler scan machines running Linux, Sun Solaris, Windows 98, and Windows NT, and with one exception, it handled all with aplomb. On the Windows NT system, the profiler didn't misdiagnose the operating system but simply chose the option "other." When we reran the profiler, it correctly identified the OS.

Like RealSecure, the NetProwler/Intruder Alert combo includes nearly 400 predefined attack signatures, and Axent regularly posts new signatures to its Web site for downloading. You can also quickly create a custom signature; we built a denial-of-service attack signature in less than 5 minutes. Though RealSecure also offers this functionality, implementing it is easier in NetProwler. RealSecure makes you toggle between three different screens and is cumbersome to use.

NetProwler keeps you abreast of current network activity and attacks in its Attacks screen. Attacks aren't sorted according to attack type or priority, however, as they are with RealSecure. And on the host side, Intruder Alert forces you to delve into graphs and text files to get a handle on potential security breaches.

But Axent's power, with its vast array of alerts and actions, more than makes up for the interface deficiencies of the products. First off, you can set different responses for high-, medium-, and low-priority attacks, a feature that isn't found in RealSecure. The responses include notifying you of the attack via e-mail or pager, setting SNMP traps to gather information sent using this standard networking protocol, disconnecting and capturing sessions, killing processes, launching program commands, and disabling user accounts.

In the end, however, both NetProwler and Intruder Alert impressed us despite their few shortcomings. Axent's offering can't rival the shiny surface of ISS's RealSecure, but its raw power gives it the edge.

RealSecure 3.1

Per network engine, \$8,995 list; per system agent, \$750.
Internet Security Systems Inc., Atlanta; 800-776-2362;
www.iss.net.

● If you're willing to sacrifice maximum power for out-of-the-box ease, ISS's RealSecure, an integrated network and host-based intrusion detection system, is a good choice. It lacks the customization features and multi-OS support that the Axent combo offers, however, somewhat limiting its appeal to homogenous Windows NT-only shops. As was the case with the NetProwler/Intruder Alert duo, RealSecure correctly diagnosed the host attacks we threw its way, but it stumbled on both the well-established denial-of-service attack Boink and the newer WinFreeze.

On the network side, RealSecure simply watches all network traffic as it approaches various machines; unlike NetProwler, it can't be fine-tuned to look for attacks based on specific operating systems and enabled services. The approaches between the competing products are similar, but NetProwler doesn't need to compare the collected network data against the entire attack signature database, saving some processor time and perhaps avoiding packet loss that can be a problem for overloaded intrusion detection systems.



Intrusion Detection

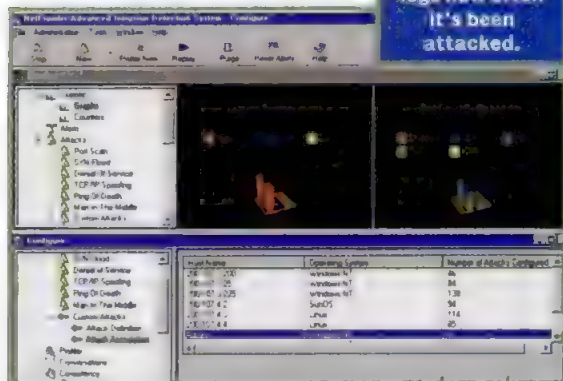
	NetProwler 3.0, Intruder Alert 3.0	RealSecure 3.1
Customization and intelligence*	Excellent	Fair
Breadth**	Good	Fair
Management	Fair	Good
Reporting, logging, and alerts	Good	Good

* Customization and intelligence refers to such features as the ability to create customized attack signatures and to scan based on the operating system.
** Breadth refers to such features as the number of attack signatures and platforms supported.

The management console is an area where RealSecure truly excels. Through the main screen you can launch, disable, monitor, and fine-tune the policies of your network engines and host-based agents. You can also watch everything that's happening in the Activity Tree. All attacks are posted in the Activity Tree by type; RealSecure comes with nearly 400 predefined attack signatures. Signature updates are sent out via CD on a quarterly basis; officials at RealSecure say that CDs will be released on a monthly basis by year end.

The Event Inspection feature lets you get such details as source and destination addresses and ports attacked, all by just right-clicking on an attack listed in the Activity Tree, or in windows on the right side of the screen that sort attacks by high, medium, and low priority. A What's This option, which launches the help file associated with the attack, explains the attack, and tells you what actions you can take to keep it from happening again. Our only complaint is that to clear the Activity Tree, which can get clogged fast, we had to shut down the entire application.

RealSecure outshines Axent's products by providing a set of 17 predefined reports, such as the top 20 events, and an inventory of IP addresses. In general, we were impressed with RealSecure. Though less powerful than Axent's intrusion detection offerings, RealSecure is incredibly easy to use, and the host- and network-based components are fully and elegantly integrated.



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Bay Networks 450T \$173 per port
Cisco 3524XL \$156 per port
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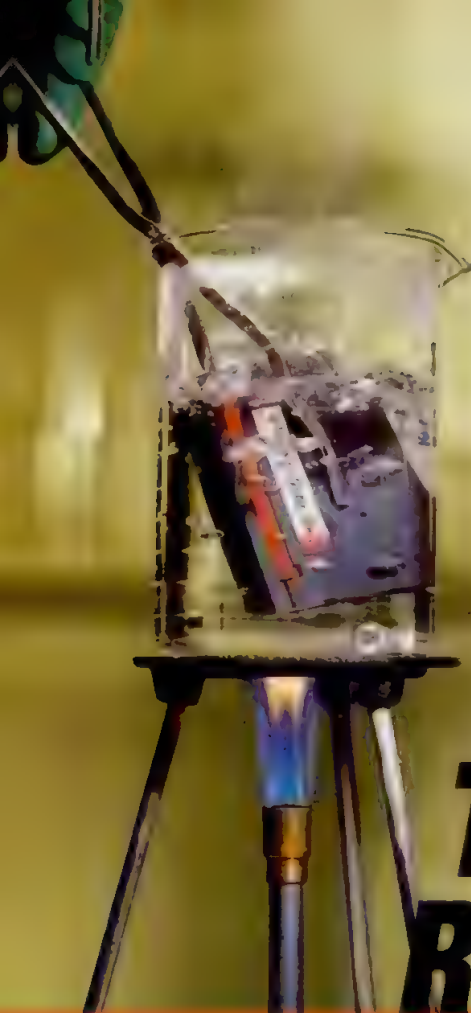
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*Figures assume 2:1 ALDC hardware compression. \$1295 MSRP for internal kit.

VULNERABILITY SCANNERS

Find Security Flaws

By Sarah L. Roberts-Witt

You can't fix what you don't know is there. Vulnerability scanners do exactly what their name implies: They poke around your network for holes that could lead to security breaches. On the server side, they look for such potential problems as expired user accounts and shaky passwords; on your firewalls, they check for misconfigurations or network services that leave you wide open for attack. Vulnerability scanners suggest fixes for problems found, but they don't take any action themselves.

We used all three vulnerability scanners to assess the servers on our network, and we tested all but WebTrends Security Analyzer against our firewalls, because that one doesn't have this feature. As expected, the products identified very few holes in the firewalls, but we were flabbergasted to find that our servers were like Swiss cheese, lacking patches that would protect them from attacks.



CyberCop

price \$12,000 for 1,000 nodes; Network Associates Inc., Santa Clara, CA; 408-988-3832; www.nai.com.

● Finding every flaw you need to know about in your network but were afraid to ask, CyberCop gives you more than enough power to unearth all of your company's soft spots. Only CyberCop lets you create customized attacks in which even the packet size can be tweaked, includes a rogue DNS server to simulate cache-corruption attacks, and boasts an extremely granular firewall scan—all of which let you dig deep for flaws. But all of this power does come at a cost in ease of use. Figuring out how to conduct basic scans isn't tough, but using the features enumerated above requires both expertise and commitment.

CyberCop's firewall scan is unique in that the scanning machines sit on either side of the firewall to send and listen for

VPN: Secure Access to Go

Security can be so negative. Just consider its vocabulary: deny, lock down, prevent, attack. You may be surprised to find out that many companies are buying firewalls not to deny, lock down, or prevent but rather to enable. These firewalls include virtual private networks (VPNs), a way to enable secure connections across the Internet. If you are still using point-to-point private connections for your interoffice connectivity or dial-up servers for remote access, consider VPNs—a much less expensive alternative and an interoperable standard.

A VPN is really just an encrypted session between two trusted entities. These entities can be firewalls, desktops fitted with VPN client software, Microsoft Windows NT servers, or even dedicated VPN products like those from VPNet Technologies. Each of the firewalls we reviewed included both VPN and VPN client software, and you generally have the option to do VPN in either a proprietary or a standard way.

True interoperability does exist between most VPN solutions. VPN companies, including most of the firewall vendors we review here—Axent, Check Point, and Network Associates—take part in interoperability tests through an organization called ICSA (www.icsa.net).

Rather than using traditional point-to-point or frame relay connections between offices, each office can use an Internet service provider (ISP) to connect to the Internet and then use a VPN to create a secure virtual link across the Internet. Similarly, users connected to the Internet through an ISP can also

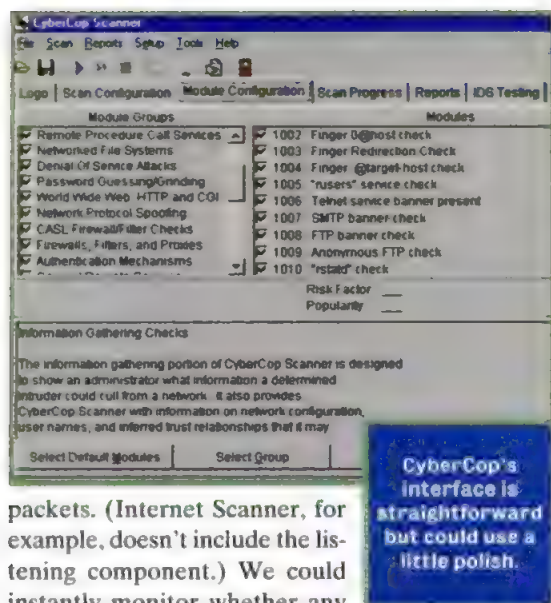
use VPN client software to connect securely back to their home network.

With the new interoperability standards in place, you can use a VPN to connect with business partners even if they use a different VPN technology. With all of the mergers and partnerships going on today in corporate America, you can't expect everyone to have the same vendor's VPN solution.

For companies that host their Web sites remotely at a service provider for better performance, reliability, or just convenience, VPN can provide a good content uploading option. A VPN is useful here, because it allows a secure connection, one that can handle multiple kinds of batch or real-time data transfers such as FTP, HTTP, or even SQL database transfers.

You may be wondering how VPN compares with other security options such as Secure Sockets Layer (SSL). SSL is the common way to create a secure link between Web browsers and Web servers and is often used for tasks such as logging on or presenting a credit card for payment. For this kind of application, SSL is much easier than VPN, because it doesn't require any client-side software since browsers are already equipped with what they need. But if you want a secure connection to send e-mail, or if you want to connect securely to a home-grown application, you'll need more than SSL. A VPN link is very flexible and works with any application that uses TCP/IP, unlike SSL.

So you see, firewalls aren't just for enforcement. They have a kinder, positive side full of possibility.—RPL



packets. (Internet Scanner, for example, doesn't include the listening component.) We could instantly monitor whether any mischievous CyberCop packets were leaking through the firewall, as well as see all the other traffic hitting it.

This is powerful stuff, but setting up the listener machine behind the firewall was more difficult than we would have liked. You get the scan results from the command line, which is unwieldy at best.

Although CyberCop's reports are jammed with good information, including suggested fixes, they are hard to negotiate, because they aren't graphical like those of ISS's Internet Scanner and WebTrends Security Analyzer. Internet Scanner does a much better job of suggesting fixes and providing links to sites with patches.

You'll be impressed by the security oomph of CyberCop, but depending on your needs, Internet Scanner or Security Analyzer may provide more than adequate functionality.

Internet Scanner

For 30 IP addresses, \$2,795 list; for 254 IP addresses, \$4,995. Internet Security Systems Inc., Atlanta; 800-776-2632; www.iss.com.

● You don't need to be a security ace to use Internet Scanner effectively. Its reports are excellent, and its suggested fixes to the holes that it finds are first-rate. But in terms of attack creation and firewall scanning, CyberCop was the clear front-runner. CyberCop has several features—firewall scanning, intrusion detection scanning, rogue DNS capabilities, and powerful custom attack functionality—

that Internet Scanner lacks. Internet Scanner is less powerful but much more polished and easier to use.

Setting up Internet Scanner and running scans seemed almost instantaneous. Within minutes, we were running an inventory scan to determine what devices were on our network, a process the product accomplished without problems. Next, we ran one of the predefined scans against some of our servers, and, as we were with other products in this roundup, we were shocked by the number of vulnerabilities that turned up.

We found the help files and information relating to security fixes first-rate. By simply right-clicking on the vulnerability discovered from the friendly three-pane interface, we could launch the "What's This" feature, which delivers a definition of the vulnerability, suggests fixes, and contains links to sites that have patches and additional information on the particular vulnerability.

Around the time you read this, Internet Scanner should have a new version out that's expected to include an updated attack list, a security policy editor to help less experienced users create scan groups, and an improved UDP scanning engine.

Though Internet Scanner doesn't have the customization options of CyberCop or the reporting depth of WebTrends Security Analyzer, it delivers precisely as advertised in a succinct, simple-to-follow format.

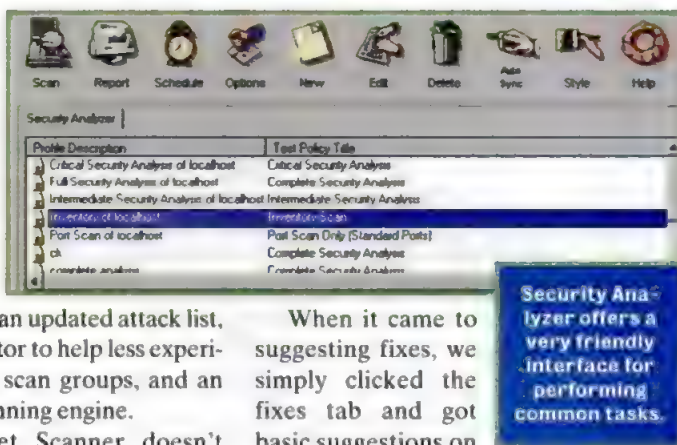
WebTrends Security Analyzer, Version 2.1

For 255 IP addresses, \$1,499 list; unlimited addresses, \$4,999; updates, \$299 per year. WebTrends Corp., Portland, OR; 503-294-7025; www.webtrends.com.

● An up-and-comer in the vulnerability scanning space, WebTrends Security Analyzer 2.1 offers strong reporting and an easily navigable interface meant pri-

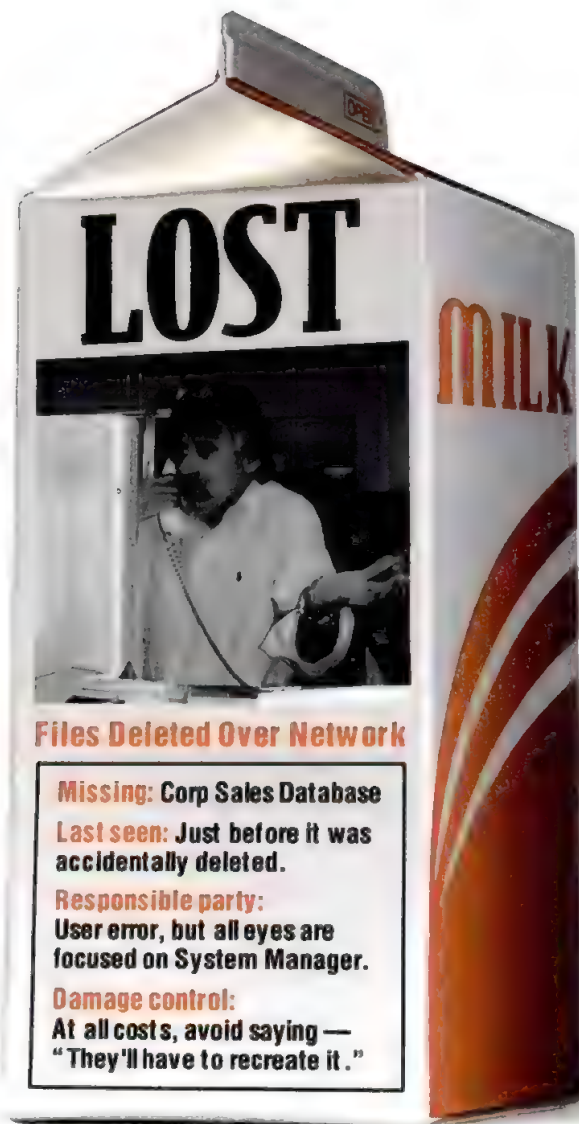
marily for scanning Web servers. WebTrends Corp. hopes to grow into the general security space but still has a ways to go. You are limited to scanning local hosts, a limitation neither CyberCop nor Internet Scanner has. Since you can't scan across your whole network—only subnets—you'll need additional products for different subnets. In addition, WebTrends Security Analyzer can assess only systems running Windows 95, 98, or NT, whereas the other two can handle Unix. Hence, WebTrends Security Analyzer is suitable only for homogeneous Windows environments.

As for inspecting the servers on our network, WebTrends Security Analyzer did an admirable job. For example, when we ran one of the five preconfigured scans on a Windows NT machine that we thought was fairly well locked down, we were shocked to learn that WebTrends Security Analyzer had unearthed 134 vulnerabilities, with most registering in the high-priority zone, such as a user account having a password that is the same as the account name.



When it came to suggesting fixes, we simply clicked the fixes tab and got basic suggestions on how to fill the holes. This feature, however, isn't as elegant or as extensive as the ones found in CyberCop and Internet Scanner. Internet Scanner gives you fix information and links to related sites right in its reports; CyberCop also integrates information about fixes into the reports.

Reporting is top-notch: The graphs and charts are more detailed and easier to read than in either of the other products we reviewed. WebTrends Security Analyzer definitely has some growing to do, but we are impressed with WebTrends' early efforts. **PC**



Rely only on backups...at your own risk

As much as 66% of all data loss is caused by accidental deletions, causing time, money and productivity to disappear with them. Because backups are not 100% reliable and do not protect data created between backups — searching to find lost files can be just as time-consuming as recreating the lost data.

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Where to shop in PC Land

There are a lot of affordable home PCs to choose from, and even more places to buy them. We compare the services and selections of 16 major retailers and Web outlets and evaluate the low-cost systems we purchased. The bottom line: There's a lot of value out there, and it's easy to find. **By Bruce Brown**

AS PC PRICES DROP, *where* you buy your next PC becomes as important as *what* you buy and *how much* you pay. Everybody wants a bargain, but no one wants to pay for it, in the form of an inferior machine or poor customer service and support.

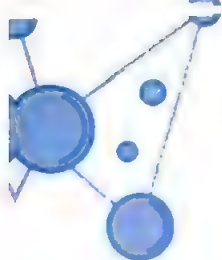
Our goal for this story was to purchase an inexpensive home PC suitable for typical, nondemanding home chores: Web surfing, word processing, home finance, and the like. We were interested not only in the quality and features of the hardware and software—what we refer to as the overall value for the dollar—but also in the buying experience.

We selected 16 sources of low-cost PCs, including office-supply superstores, computer superstores, a large discount

store, two national electronics chains, a national buying club, and direct-sales PC merchants with catalogs and Web sites. Our reviewers posed as ordinary shoppers looking for basic home PCs; our price target was \$800 or less (not including monitor), though we gave our secret shoppers the leeway to spend more if necessary. Your experiences at each of the outlets may vary from ours, but with just one or two exceptions (noted in the reviews), we found that the sites and people involved in selling PCs were informed, helpful, cheerful, and polite.

For example, the salespeople at Circuit City, Gateway Country, RadioShack, and Staples were all helpful and knowledgeable. We also found some Web sites with system-configuration tools that were

Our Contributors: BRUCE BROWN is a contributing editor of *PC Magazine*. CADE METZ is a senior writer at the magazine, and MARGE BROWN is a freelance writer. RICH FISCO was the labs project leader, and senior associate editor Jamie M. Bsales was in charge of this story.



particularly useful, specifically those of NECX, PC Connection, and Tigerdirect.com. As we found with ShopIBM, the Dell Refurbished Online Outlet, and Value America, it's a good idea to call for sales assistance, even when a Web site seems to have all the information you need. Live sales associates often know of special deals not posted on the Web. Most systems shipped quickly, although not all arrived by the days they were promised. Whenever we ordered machines that would be shipped, we were able to get some sort of confirmation or tracking number for assistance.

As for the hardware we bought, the PCs were fair values for their respective prices. In fact, we found that you don't have to give up much to get a very good deal on a perfectly competent home PC: We paid \$429 for a refurbished Presario from Compaq's Web site (albeit one based on a low-end Cyrix CPU); the average cost of a system and monitor was just \$880.

All of the systems worked right out of the box, although we had problems with two monitors. At no time did we feel cheated, but our experiences underscored the benefit of knowing what you're looking for when you explore the retail and Internet jungles for cheap PCs. Buyers with different levels of PC savvy and support needs will do better at different types of PC outlets: Some outlets (such as Circuit City, Gateway Country, and RadioShack) are ideal for first-time buyers who need advice and hand-holding. Other sellers (including NECX Direct, PC Connection, and Tigerdirect.com) let an experienced PC buyer drill down to find the best deal quickly.

Note that at these price levels, you're getting trailing-edge processors and basic hardware in most instances. The PCs we bought generally came equipped with smaller hard disks (about 3GB to 4GB) than higher-end home systems, less RAM (32MB was the norm), and less video memory (4MB, versus the 8MB to 16MB we recommend for gaming and to support the higher resolutions found in large monitors). The cases also generally offered limited expandability. Still, all of these units are fine as light-duty primary machines for the home and are ideal as second PCs whose main task is Internet access.

And you don't have to settle for a bare-bones machine. We purchased fine home systems by Compaq, Dell, Gateway, HP, and IBM that came complete with user-friendly documentation, trial ISP memberships, keyboards with programmable Internet hotkeys, complete software bundles, lifetime tech support, and other creature comforts. If price is your primary

FINISH!



BONUS!

\$100 rebate.



NOTICE!
The sales staff
was at a rave
until 5:00 A.M.



GOTCHA!

Some "included"
software expires
in 30 days.

GOTCHA!

Out of stock.



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Full year of
Internet access
included.



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Right to Value. Your



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Deskpro EP
Towerable desktop computer

\$1119.68

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Simple
TECHNOLOGY

64MB memory
upgrade

\$99.57

CDW 115517



NECTechnologies

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17" monitor, 16" viewable image size

\$286.82

CDW 137312



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I Iomega Click! PC Card drive
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PC Card Type II drive
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CDW 165724

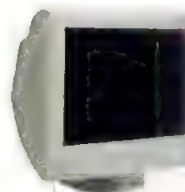
LINKSYS
EtherFast PC Card
10/100 LAN Card
\$75.50
CDW 94392

Canon
BJC-80
Portable Color
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CDW 94630

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Upgrade
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AP200
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QMS magicolor 2
DeskLaser printer
\$1179.99
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56K modems are capable of 56Kbps downloads, however, current regulations limit download speed to 53Kbps.
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\$599.00

CDW 159487

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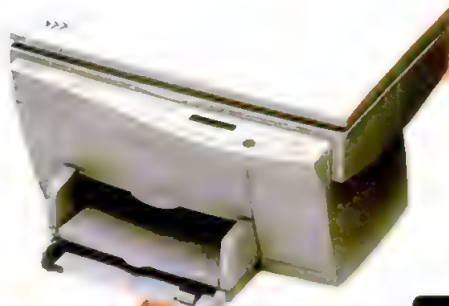
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10/100 8-port switch

- 10/100 autosensing per port allows you to connect any 10BASE-T or 100BASE-TX device
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CDW 164578

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External print server for Ethernet networks

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- Microsoft Windows NT simple device installation via HP network printer installer for Windows NT

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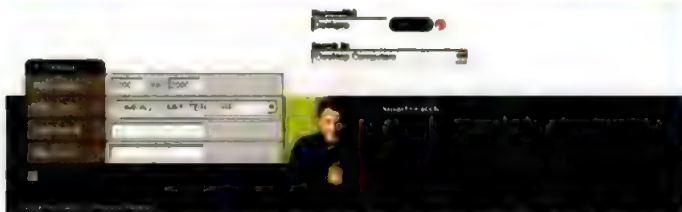
HP JetDirect 300X External 10/100 print server

\$248.45 CDW 102969

- Multi-NOS/multi-protocol support for Ethernet and Fast Ethernet networks
- Supports NDS, NDPS, SNMP, DHCP/WINS and lpd
- Automatic network/protocol switching
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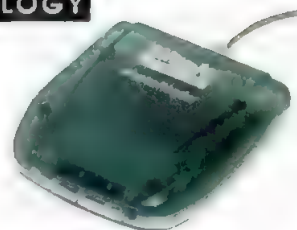
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- External AC adapter
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- Supports Mac OS and Windows® 98

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CDW 140297



PS790

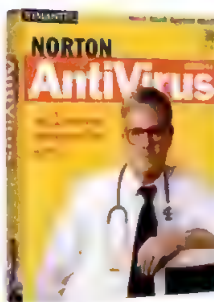
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- 19" SuperClear™ screen,
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CDW 114966

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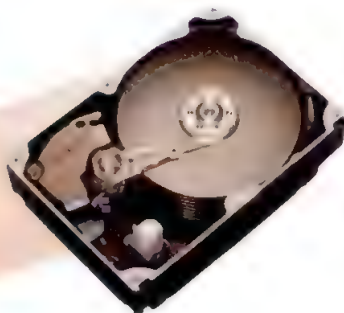
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For Windows 95, 98 and NT

Symantec Norton AntiVirus V5.0 lets you quarantine infected files, making it easier to get help with viruses directly from the Symantec researchers and automatically protect yourself against all viruses and malicious Active X and Java applets. As always, Norton AntiVirus runs constantly in the background to keep your computer safe from viruses.

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6.4GB 3.5" low profile ATA/4 hard drive

- Ultra ATA/66 interface
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56K modems are capable of 56Kbps downloads, however, current regulations limit download speed to 53Kbps.

Internet connectivity requires access services from an Internet access provider. Contact your local access provider for rates, terms and conditions.

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concern, consider one of the more generic offerings by CompUSA, eMachines, MaxTech, Pionex, or Proteva.

If you can access the Internet and don't mind buying a used system, consider the Compaq Works site, the Dell Refurbished Online Outlet, and Shop-IBM. We found helpful assistance and good deals, saving an estimated \$100 by purchasing used rather than new

machines. Note that the selection can vary daily, and make sure that the system comes with a strong warranty.

Also, before you commit to any machine, be sure the service and support offerings match your level of experience. Many low-cost machines come with only a limited window of free tech support (90 days or less). That's fine if you can troubleshoot problems on your own, but it can

prove costly if you need help after the free tech support runs out. Finally, be sure to check the system maker's scores in our annual Service and Reliability Survey (July 1999; www.pcmag.com). Among the makers included here, Dell and IBM receive grades of A for home machines from our readers; Gateway and HP each receive a C, while Acer and Compaq earn the lowest grades.

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indicates a store



indicates a Web site



indicates a catalog

MaxTech Y2KMX1

AMD K6-2/333, 32MB RAM, 3.2GB hard disk, 4MB AGP graphics (SiS326 chip set), 56K modem, speakers, \$500. 15-inch Optique Q51 monitor, \$124. Delivery, \$118.

● Buy.Com's Web site is organized exceptionally well, with a broad selection of various manufacturers' computers and monitors, payment options, and shipping schedules. But we endured technical difficulties during our ordering period. If you are an Internet buyer, Buy.Com is worth perusing, though we preferred the experience at NECX Direct, PC Connection, and others.

Buy.Com's server was down the first day we attempted to make a purchase. The next day, the shopping cart would accept only one item. A telephone call yielded no assistance; after a 7-minute hold, we spoke with a sales representative who could not access the system. On the third day, the shopping cart continued to malfunction. So we called again, and this time a sales representative was able to complete our order for us.

The MaxTech PC is a generic system with equally generic reference documentation and setup help, including a minimally helpful setup poster. Setup guides from Compaq, Gateway, and HP were much

more helpful. With no software other than Windows 98, the MaxTech system has no special attributes aside from MaxTech's three-year warranty.

Buy.Com will beat any competitor's price by 10 percent if you find a lower price for the same system within seven days of purchase. Unlike other low-cost outlets, you have a generous 30 days to return the system, though you have to pay for shipping.—*Marge Brown*



Compaq Presario 5340

AMD K6/400, 96MB RAM, 4.3GB hard disk, 4MB AGP graphics (SiS5595 chip set), 56K modem, \$803. 15-inch Pixie 555 monitor, \$137. Delivery, \$35.

● CDW Computer Centers is one of the best-recognized

direct sellers of all manner of PCs and peripherals. If you're shopping via telephone from one of its print ads or catalogs, you'll be pleased with the experience and the value (especially the lifetime tech support). We found, however, that the CDW Web site trails competitors such as NECX Direct.

While CDW's Web site lists many PC models from various manufacturers (including Compaq, HP, and IBM), we found that the in-stock selection of low-cost systems was limited when we actually went shopping. (CDW points out that it caters mostly to businesses, so low-cost home machines are not its forte.) Navigating CDW's Web site to make a purchase was not productive; search buttons, for example, did not consistently produce specifications. We had much better luck using CDW's toll-free order line. CDW has done

a great job of equipping its personable sales representatives with a fax-back system for sending detailed information during a call.

The Compaq Presario 5340 is a fine machine. The system includes a great keyboard with multimedia and Internet buttons; two convenient, front-mounted USB ports; and a game port. A detailed box-topper covers both hardware and software setup, and the color-coded ports with contrasting color icons are better designed than those of most other low-cost PCs we reviewed. The software bundle is generous.

PC EDITORS' HOT LINKS

www.pcmag.com/homepcs99

We present our buying experiences at the various outlets in the reviews, and we're sure you have your own tales to tell. Visit us online and tell us your story. What was your shopping experience like? What went right? What went wrong? And to augment your cheap (or even free) PC, try some free software.

► Jumbo!

www.jumbo.com

Jumbo! offers more than 300,000 shareware and freeware programs. The site highlights a Program of the Day and offers well-written descriptions.

► ZDNet

www.zdnet.com/swlib/

ZDNet's software library has a section on free utilities and a section for free downloads.

In addition to Compaq's standard one-year parts-and-labor warranty, CDW provides free 24-hour seven-day telephone technical support for the life of the computer—almost unheard-of at this price level.—*MB*



HP Pavilion 4530

AMD K6-2/350, 32MB RAM, 4GB hard disk, 4MB AGP graphics (SiS5595 chip set), 56K modem, \$599. 15-inch HP monitor and speakers, \$199.

• If you'd rather buy your new PC in a retail store, Circuit City may be an excellent option. Selling PCs from Compaq, eMachines, HP, IBM, and NEC at more than 500 stores across the country, the popular electronics retailer offers a wide variety of systems.

With the help of a patient, informed Circuit City salesperson, we needed less than a hour to canvass several PCs, discuss warranty options, and make our purchase. The HP Pavilion 4530 is a welcome choice for a low-end home PC. We had our new PC up and running in a snap with the aid of a setup poster and several wizards that launched as we first entered Microsoft Windows 98. One such wizard shows PC neophytes how to use the mouse and the keyboard. A second wizard gets you on the Internet quickly for 50 free hours of Internet access. You can choose to run a tutorial that clearly and carefully explains the workings of the Windows desktop via audio clips and accompanying screenshots. Should you have problems with your hardware or operating system, there's a graphical HP Help interface that lets even the greenest users

troubleshoot on their own. In addition to Windows and the wizards, we got Microsoft Works and Money, a recovery CD, a keyboard with volume controls and programmable application and Internet buttons, and a Polk audio system with crisp sound. The system's performance was about midpack among our group.

Circuit City's return policy is a bit strict: Merchandise can be returned within 14 days only, and we would have been hit with a 15 percent restocking fee. But this is the only drawback to an otherwise excellent shopping experience.—*Cade Metz*



Compaq Presario 2266

Cyrix MII/300, 64MB RAM, 4GB hard disk, 4MB PCI graphics (SiS5598 chip set), 56K modem, \$429. 17-inch Compaq S700 monitor, \$329. Delivery, \$88.

• We found the Compaq Works Web site easy to navigate and adroit at providing reassuring responses throughout the purchasing process. While the selection of refurbished computers and monitors is more limited than that of the Dell Refurbished Online Outlet, the Compaq site is worth considering.

The Compaq site was excellent at walking us through our order. We received credit card and order confirmation, billing and shipping information, and two follow-up e-mails confirming our registration and shipment date. Moreover, when we called for help, the Compaq salesperson was knowledgeable and courteous.

A relatively compact machine with limited expansion capability, the Compaq Presa-

Editors' Choice

• Gateway Country: Gateway Essential 400c



Buyers interested in an affordable, user-friendly home PC—and lucky enough to live near one of the 171

Gateway Country locations—should make this their first stop.

We found the sales staff courteous, helpful, and knowledgeable. At Gateway Country, you can get hands-on experience with the PC, software, and options you are considering. The Gateway Essential 400c we purchased is a fine machine for home use, with a Celeron/400 CPU, an 8MB ATI graphics subsystem, a Creative Labs 3-D audio card, and excellent Cambridge SoundWorks speakers. The software bundle is ample (and useful), and at initial boot-up you are greeted by a wizard that provides one-click access to the Internet. Spend \$1,000 or more on a system and you get a year of free Internet service. At \$879, the 400c wasn't the least expensive PC we purchased, but we feel it was the best value for our money. And though you can't take a PC home with you (it's built to order and shipped to your home within a few days), Gateway has done a commendable job marrying a fine PC to a pleasurable buying experience.

Honorable mention among retail sellers goes to RadioShack. Like Gateway Country, RadioShack offers only one brand of PCs. But the Compaq Presario line is one of our favorites for home users, thanks to an excellent step-by-step setup poster, color-coded connectors, complete software bundle, and welcome extras such as a keyboard with application buttons and Internet launch keys.

Among Web-based retailers, we award honorable mention to NECX Direct. The well-organized site makes it easy to comparison-shop among the range of brands offered, and good deals abound.

rio 2266 we purchased is a good bet for first-time users. Like the machines from HP and Gateway, the included boxtopper makes setup simple, and the keyboard includes keys for CD-ROM control and one-touch application and browser launching. Compaq provides a comprehensive software suite as well. As expected from the relatively low-power Cyrix CPU, the machine's performance was near the bottom on our benchmark tests. On the

plus side, the low price let us trade up to a 17-inch Compaq monitor.

Although you have only ten days to return a refurbished Compaq purchase, Compaq pays for the shipping. Compaq backs the system with warranty and telephone service and support for 90 days, with an option to extend both for two years (a worthy \$100 investment). We would certainly recommend the Compaq site to the bargain hunters among you.—*MB*



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- 64MB Synchronous DRAM
- Built-in DVD-ROM
- Integrated V.90/K56flex modem*
- 3D Sound System
- Windows® 98 or Windows NT operating system

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Business Lease \$87/mo, 36 mos[†]

Satellite 4090XDVD

- Intel Mobile Celeron™ processor 400MHz
- 6.4 billion byte hard disk drive
- 14.1" dia. TFT active-matrix color display
- 64MB Synchronous DRAM
- Built-in DVD-ROM
- Integrated V.90/K56flex modem
- 3D Sound System
- Windows 98 or Windows NT operating system

\$2,399

Business Lease \$75/mo, 36 mos[†]

Satellite 2590CDT

- Intel Mobile Celeron processor 400MHz
- 6.4 billion byte hard disk drive
- 12.1" dia. TFT active-matrix color display
- 64MB Synchronous DRAM
- Built-in 24X* max. speed CD-ROM
- Integrated V.90/K56flex modem
- 3D Sound System
- Windows 98 operating system

\$1,699

Business Lease \$53/mo, 36 mos[†]



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equals unbeatable value.



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- Intel Pentium III processor 500MHz
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- 12.9 billion byte hard disk drive
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- Windows 95 operating system
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- Desktop chassis with 5 drive bays and 4 slots

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Business Lease \$43/mo, 36 mos^s

7100S: PV1045U-BXEL2
7100D: PV1046U-BXEL2

Equium 7100 Series

- Intel Pentium III processor 450MHz
- 128MB high performance Synchronous DRAM
- 8.0 billion byte hard disk drive
- 40X max. speed CD-ROM
- Integrated 3Com Fast EtherLink XL 10/100
- Instant Access Door for improved upgradeability and serviceability
- Value Keyboard
- Windows 95 operating system
- Slimline chassis with 3 drive bays and 2 slots
- Desktop chassis with 5 drive bays and 4 slots

\$1,149^s

Business Lease \$36/mo, 36 mos^s

7100S: PV1045U-6VEL2
7100D: PV1046U-6VEL2

Equium 7100 Series

- Intel Pentium II processor 400MHz
- 64MB high performance Synchronous DRAM
- 6.0 billion byte hard disk drive
- 40X max. speed CD-ROM
- Integrated 3Com Fast EtherLink XL 10/100
- Instant Access Door for improved upgradeability and serviceability
- Value Keyboard
- Windows 95 operating system
- Slimline chassis with 3 drive bays and 2 slots
- Desktop chassis with 5 drive bays and 4 slots

\$999^s

Business Lease \$31/mo, 36 mos^s

7100S: PV1045U-D3AJ0
7100D: PV1046U-D3AJ0

TOSHIBA

Nearly Free PCs

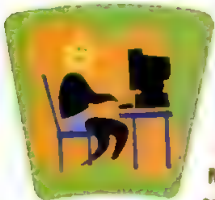
If the thought of spending even as little as \$500 on a PC still ruffles your feathers, take heart: You can get a PC free. Well, almost free. The deals do have catches—a long-term commitment to an ISP, for example, or a portion of the screen permanently sacrificed to advertising—but the machines themselves are fine as Web appliances and for typical home uses such as word processing.

Enchilada (www.enchilada.com): For \$399, you get the "whole enchilada": a 350-MHz AMD K6-III system, stereo speakers, and three years of Internet access. The catch: Monitor, warranty, and extended tech support are sold separately.

Free-PC (www.free-pc.com): 10,000 lucky applicants selected by Free-PC received 333-MHz Cyrix systems (by Compaq) and free Internet access. The catch: You must use the system at least 10 hours per month, and about 40 percent of its 15-inch display is dedicated to advertising.

InterSquid (www.intersquid.com): The company with the eccentric name provides a 333-MHz Celeron-based PC and Internet access for \$29.95 per month. The catch: You must commit to 30 months (and \$30 a month is high in today's market), and either submit to a costly credit check or pay all the money up front.

MyFreePC.com (www.myfreepc.com): Not to be confused with Free-PC, MyFreePC provides a low-end PC when you pay \$26.79 per month for Internet access. The catch: You must commit to 19 months and—to avoid an interest-bearing loan—pay up front.—CM



CompUSA American Pro AP300L-SBE

Pentium II/300, 128MB RAM, 9.6GB hard disk, 4MB AGP graphics (ATI Rage Pro Turbo AGP chip set), 56K modem, speakers, \$599.95. 15-inch monitor, \$149.95. Delivery, \$47.48.

• We found the shopping experience at one of CompUSA's retail stores rather uneven. And the CompUSA American Pro system we purchased, while a good value, is not as friendly for first-time home PC users as those from Compaq, Gateway, HP, and others.

Our goal was to purchase an inexpensive PC that was still a good value, so we opted for one

of CompUSA's refurbished systems. When we shopped in early June, the sales staff was irritable, and no sub-\$800 demo PCs were in stock. This may not be indicative of CompUSA Stores nationwide, but it stands in stark contrast to our experiences at Circuit City Stores and RadioShack in Manhattan. We were told to try ordering over the phone, where we were able to find a good bargain quickly with the help of an informed, polite operator. Though we could have opted for Federal Express next-day delivery, we stuck with CompUSA's standard ground service, and the system arrived three business days later, as promised. Its speakers were dirty and its front panel was permanently askew, but everything else was clean and intact.

Unfortunately, ease of use and convenience features are lacking compared with those of the other low-cost systems in this roundup. The system came without printed documentation (it's on CD only), and the keyboard lacks one-touch application and Internet buttons. On the plus side, Microsoft Windows, Word, Works, Money, and Encarta are included. Benefiting from 128MB of RAM, this system is relatively fast, and it offers a generous 9.6GB of storage space.

CompUSA's return policy is rather strict: To return a working system, you must notify the company within ten days of purchase and pay for shipping. A one-year warranty is included.—CM



Dell OptiPlex G1

Celeron/333, 64MB, 4.3GB hard disk, 2MB AGP graphics (ATI Rage IIc AGP chip set), 56K modem, \$628. 17-inch Dell 1000 LS-17 monitor, \$199. Delivery, \$95.

• The Dell Refurbished Online Outlet provides first-rate service when it comes to browsing its Web site for products and availability, and we were very pleased with the value we got. The site is a good bet for buyers who don't need the hands-on service of a retail store and who like hitting on a bargain.

Unlike Dell's new-PC site, where you can place your order online, you need to call a Dell Refurbished Online Outlet sales representative to place your order. As it turned out, calling in the order worked to our advantage: Not only was our contact courteous, helpful, and knowledgeable, but she substituted a 17-inch monitor for the unavailable 15-inch

model—at no extra charge.

The best value for the dollar turned out to be one of Dell's business-oriented OptiPlex machines (rather than a home-oriented Dell Dimension). The Dell OptiPlex G1 is a reasonably powerful system for general use, with a helpful setup poster and installed diagnostic software. The bundled Turtle Beach Montego A3D 64-voice sound card was a step up from those of most other systems in this roundup. The PC's well-balanced software bundle includes Microsoft Word, Works, Money, Encarta, Picture It! Express, and more. The only sour note in this new-looking system was that the refurbished mouse was stained and obviously used—a turnoff in an otherwise positive buying experience.

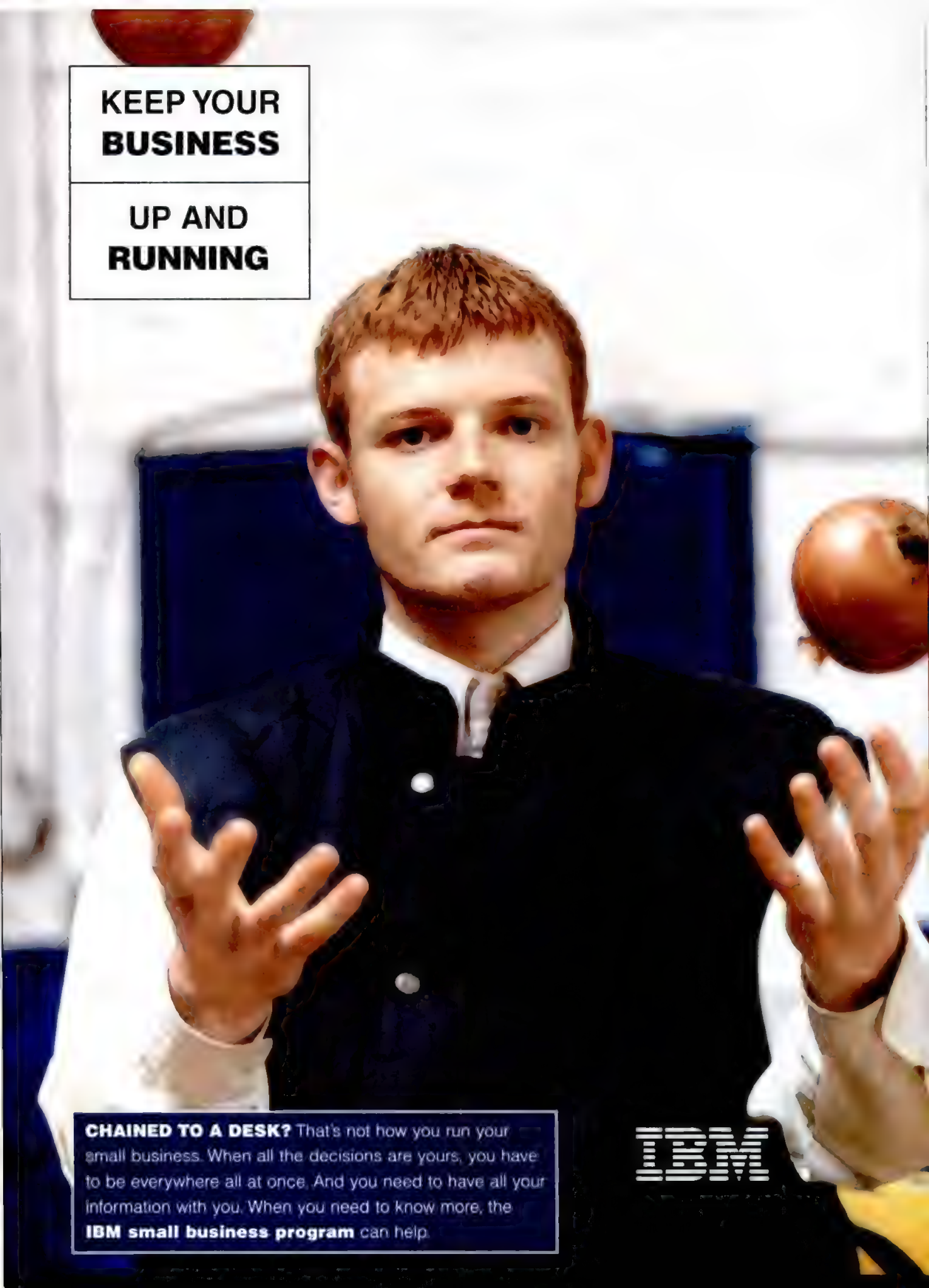
Dell offers an impressive three-year on-site service policy and telephone support for the life of the system—a better plan than most in this roundup. Note that you have only 14 days from the shipment date to return a refurbished system, and shipping is at your expense.—MB



eMachines eTower 400i

Celeron/400, 32MB RAM, 4.3GB hard disk, 4MB AGP graphics (ATI Rage IIc AGP chip set), 56K modem, speakers, \$675. 15-inch eView 15s monitor, \$130. Rebate, \$75.

• Although the eMachines Web site stands out from the crowd by presenting beautiful color photos of its computers' internal designs, the eMachines eTower 400i's rather generic hardware is bested by the similarly priced Compaq and HP models. And though the site will help you pick a machine, you can't place an order there.

A man with short brown hair, wearing a dark blue business suit over a white shirt and a patterned tie, is seated in a dark blue office chair. He has his hands raised in front of him, palms facing forward, with fingers slightly spread. He is looking directly at the camera with a neutral expression. In the background, a pomegranate is visible on the right side, and another one is partially visible at the top left. The overall scene suggests a business setting where the man is multitasking or managing multiple tasks simultaneously.

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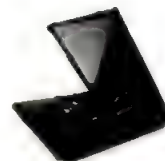
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Instead, you will be directed to the nearest retail dealer—in our case, a local Staples office-supply superstore. As with Circuit City and RadioShack, the sales representatives at Staples were knowledgeable and helpful.

The eTower 400i is a reasonable deal for the money, though it has no unique features other than front-panel USB and game ports for quick peripheral connections. The minimal start-up and user manuals did not cover this specific model, and the bundled software consisted only of Microsoft Works for Windows 95. Also, the eMachines system had the lowest Winstone test scores in this group.

The eMachines warranty provides one year of coverage for parts and labor and 15 days of telephone technical support from the date of your first call. An extended support option is available for \$59, which adds

another two years of parts and labor coverage and three years of telephone technical support. In addition, Staples offers its own optional Computer Protection Plans, ranging from \$100 to \$180. Staples lets you return a system within 14 days with no restocking charges.—MB



Gateway Essential 400c

Celeron/400, 32MB RAM, 4.3GB hard disk, 8MB AGP graphics (ATI Rage 128 VR chip set), 56K modem, speakers, \$699. 15-inch Gateway EV500 monitor, \$180. Delivery, \$95.



Buying a PC in a Gateway Country store is a satisfying shopping experience, and both the store and the machine are among



The Gateway Essential 400c includes helpful extras, such as an easy-as-pie setup poster.



The **buying experience** rating covers the convenience of buying the system; the knowledge, helpfulness, and courtesy of the sales staff; and the scope of the selection available from the seller.

The **out-of-box experience** rating is based on the presence of an easy setup poster, well-marked color-coded connectors, good docu-

mentation, an Internet wizard, and a free trial membership with an ISP.

Overall value reflects the quality of the hardware relative to the price. We also look at the warranty and technical support, as well as whether any extras are included.

In **performance** (tested speed), none of these machines is sensational. But they should prove good enough for surfing the Web, word processing, and the like.

Outlet	System	Buying experience	Out-of-box experience	Overall value	Performance
Buy.Com	MaxTech Y2KMX1	Poor	Good	Fair	Fair
CDW Computer Centers	Compaq Presario 5340	Good	Excellent	Excellent	Good
Circuit City	HP Pavilion 4530	Excellent	Excellent	Excellent	Fair
Compaq Works	Compaq Presario 2266	Excellent	Excellent	Excellent	Fair
CompUSA	CompUSA American Pro	Fair	Poor	Good	Good
Dell Refurbished Online Outlet	Dell OptiPlex G1	Excellent	Good	Good	Good
eMachines/Staples	eMachines eTower 400i	Excellent	Good	Fair	Fair
EDITORS' CHOICE Gateway Country	Gateway Essential 400c	Excellent	Excellent	Excellent	Good
NECX Direct	AcerPower 6000	Excellent	Good	Good	Fair
PC Connection	Compaq Presario 5184	Good	Excellent	Excellent	Good
RadioShack	Compaq Presario 5070	Excellent	Excellent	Good	Fair
Sam's Club	Pionex P-CM11350	Fair	Good	Good	Fair
ShopiBM	IBM Aptiva E Series 240	Excellent	Excellent	Excellent	Fair
Tigerdirect.com	Tiger Pro Series 233	Good	Fair	Fair	Fair
Value America	Proteva AK400	Excellent	Poor	Good	Good
Wal-Mart	HP Pavilion 4473	Fair	Good	Good	Good

our favorites for first-time home PC buyers. You get the advantages of seeing, touching, and trying the products, talking to well-trained sales representatives, and enrolling in free software training. You can't take a PC home from these locations as you can with a traditional retailer, but you can get help from the knowledgeable staff to customize a system.

The Gateway Essential 400c comes in a micro-tower case holding a modest but acceptably performing 400-MHz Celeron processor and a better-than-average 8MB ATI Rage 128 VR graphics subsystem. Our test system configuration is a complete package with lots of extra touches, including helpful documentation, an excellent setup poster, a CD binder, a keyboard with multimedia and Internet hotkeys, and the best speakers in the roundup (Cambridge SoundWorks SBS52). These very good speakers, coupled with the 400c's Creative SoundBlaster 64D audio subsystem, provide a fine base for



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Affordable Home PCs



When price is your primary consideration, performance will suffer. These machines are built around aging AMD, Celeron, and Cyrix CPUs but are still good enough for many home users.

Performance is not something you should expect from low-cost PCs. Some machines are built around out-of-production processors—like the Pentium MMX in the Tiger system—and slow-spinning hard disks (less than 5,000 rpm)—like those in the eMachines eTower 400i and Compaq Presario 5070. And most makers have skimped on the RAM to hit low price levels. The average Winstone score for the group (12.0) is about 40 percent lower than the score for the “perfect” home PC we recommended in our Perfect PC issue (July 1999). Of course, that machine, with its Celeron/466 CPU, 128MB of RAM, 10GB 7,200-rpm hard disk, and 8MB graphics subsystem, would cost you \$1,500. The average price for systems in this roundup is \$880.

That said, each of the machines we tested provides good enough performance for surfing the Web, word processing,

and other typical home PC chores. The only area where most are lacking is in 3-D performance for games. We tried running our ZD 3D WinBench tests on all the systems, but only the Gateway was able to complete them, with a score of 320—about one-third the scores of the best systems we’ve seen to date.

Some systems didn’t have enough memory to run the 3D WinBench tests in 1,024-by-768 resolution at a 16-bit color depth. The worst offenders did not have a 3-D HAL (hardware abstraction layer) loaded. Without a 3-D HAL, which is usually loaded by the driver, the system will default to software emulation for 3-D graphics, and many games will run either very poorly or not at all.—*Analysis written by Rich Fisco*

How We Tested

We used our benchmark test program ZD Winstone 99, Ver-

sion 1.0, to measure performance on 32-bit Windows applications. ZD Business Winstone 99 measures the time a PC takes to execute a set of scripts that exercise eight Windows 98 office suite applications and an Internet browser. The scripts include task switching between a suite application and the browser. Business Winstone 99 weights a PC’s test timings based on the applications’ unit market shares; it derives a composite number and converts that to a relative score.

The ZD CPUmark 99 score gauges the speed of a PC’s processor subsystem, which includes the CPU, primary and secondary cache, and system RAM, under 32-bit operating systems. CPUmark 99 emulates the CPU activity of the real-world 32-bit applications used in Business Winstone 99. CPUmark 99 has a large memory footprint, and its cache characteristics are representative of modern applications.

▼ The HP Pavilion 4473 we bought from Wal-Mart was the best all-around performer. Models we bought from CDW, CompUSA, Dell, Gateway, and Value America also performed respectably.

playing audio CDs or listening to streaming audio via the Internet. If you spend \$1,000 or more on a PC and peripherals, you get a year of Internet access (with Gateway as your ISP). In fact, when you first start the Gateway system you’re greeted with a one-button connection to Gateway.net for Internet access and e-mail service.

Although you have to wait from six to ten days for delivery, you also have 30 days to request a refund or replacement, shipping at your expense. The Gateway Country buying experience—and the end product—is one of the best in this roundup.—*MB*



AcerPower 6000

Celeron/300, 32MB RAM, 4.3GB hard disk, 8MB graphics (ATI Rage Pro Turbo chip set), 56K modem, speakers, \$675. 15-inch Sony CPD-110GS monitor, \$188.

●NECX excels at presenting an array of hardware options for evaluation and painless purchasing via the Internet. The NECX site is so well-organized that even first-time buyers probably won’t need to speak to a sales representative. You save \$25 by ordering online and receive free ground shipping for orders over \$500—both appealing sales incentives.

Even better, NECX carries brands from an extensive list of manufacturers. Comparison shopping is encouraged via an automated function that displays specifications on multiple devices for analysis.

The PC was delivered three days early. When the monitor did not arrive on time, a call to NECX sales support resulted

High scores are best. Bold type denotes first place.					
denotes Editors' Choice.					
Seller	System	CPU	RAM	ZD Business Winstone 99	ZD CPUmark 99
Buy.Com	MaxTech Y2KMX1	AMD K6-2/333	32MB	9.0	18.9
CDW Computer Centers	Compaq Presario 5340	AMD K6/400	96MB	14.4	27.0
Circuit City	HP Pavilion 4530	AMD K6-2/350	32MB	10.3	23.6
Compaq Works	Compaq Presario 2268	Cyrix MII/300	64MB	9.6	15.6
CompUSA	CompUSA American Pro	Pentium II/300	128MB	14.7	22.7
Dell Refurbished Online Outlet	Dell OptiPlex G1	Celeron/333	64MB	14.4	26.4
eMachines/Staples	eMachines eTower 400i	Celeron/400	32MB	8.0	30.6
Gateway Country	Gateway Essential 400c	Celeron/400	32MB	13.6	31.1
NECX Direct	AcerPower 6000	Celeron/300	32MB	8.9	12.3
PC Connection	Compaq Presario 5184	AMD K6/380	64MB	13.5	22.3
RadioShack	Compaq Presario 5070	AMD K6-2/350	32MB	7.2	21.4
Sam's Club	Pionex P-CMII350	Cyrix MII/350	48MB	N/A	20.8
ShopiBM	IBM Aptiva E Series 240	AMD K6-2/350	64MB	12.9	25.6
Tigerdirect.com	Tiger Pro Series 233	Pentium MMX/233	32MB	N/A	8.7
Value America	Proteva AK400	AMD K6/400	64MB	16.6	26.4
Wal-Mart	HP Pavilion 4473	Celeron/400	64MB	17.7	31.1

NA—Not applicable: The product could not perform this test.



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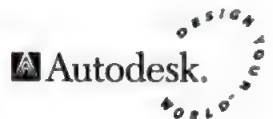


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in next-day delivery. Unfortunately, the Sony monitor had a 3-inch hot spot, requiring a product replacement, which was handled quickly and courteously by NECX.

The AcerPower 6000 we picked includes a cacheless 300-MHz Celeron processor—the type that gave Celeron a bad name—but also an impressive 8MB ATI graphics subsystem (most others in this range make do with 4MB). Setup is made simple for the novice with thorough documentation and color-coded cabling with plain-English text labels; support software is installed on the hard disk. The included software consists of Windows 98 only. Unlike the machines of Gateway, HP, and others, Acer does not include a trial ISP membership or quick-access Internet keys.

You can return opened goods purchased from NECX within 24 days of the date received for credit minus the shipping charge and a restocking fee of 15 percent or \$15, whichever is larger.—MB



Compaq Presario 5184

AMD K6-2/380, 64MB RAM, 6GB hard disk, 4MB AGP graphics (SiS5595 chip set), 56K modem, \$749. 15-inch Magnavox 105MB monitor, \$159. Delivery, \$91.20.

● PC Connection's Web site offers hundreds of machines from various manufacturers, and helps you quickly and easily find a system that meets your needs. The site's System Selector (a wizard that asks you what you're looking for, then displays systems that fit your description) is a real time-saver. PC Connection is a good place to start—and end—your PC search.

Using the System Selector, we located 36 mini-towers priced from \$500 to \$1,000. Many manufacturers are represented on the site (in fact, PC Connection now sells a house brand known as Epiq), and we chose the \$749 Compaq Presario 5184 backed by Compaq's one-year warranty and round-the-clock phone support. Our one qualm with the site's buying scheme is that monitors are typically listed separately from PCs. Our Presario wasn't bundled with a monitor, so we added an inexpensive Magnavox model to our purchase—forgetting that Presario speakers are typically sold with Presario monitors, not with mini-towers. Our PC arrived without speakers because of our own negligence, but PC Connection makes it very easy to fall into such traps.

Like the other Presarios we purchased, this model shipped with a setup poster, several popular third-party applications, system-recovery software, an Internet wizard to set up 50 free hours of access, and an Internet- and multimedia-ready keyboard. In line with its price, the Presario 5184's performance was above average.

The company charges a 15 percent restocking fee for all returned machines. Still, PC Connection is ideal for the comparison shopper who hates to leave home.—CM



Compaq Presario 5070

AMD K6-2/350, 32MB RAM, 4GB hard disk, 4MB AGP graphics (SiS5595 chip set), 56K modem, \$599. 15-inch Compaq monitor and speakers, \$279.

● We were as impressed with RadioShack's finance and



Color-coded connectors make Compaq Presarios a snap to set up.

warranty plans as we were with the Compaq Presario 5070 we purchased. Offering a few select Compaq Presario models at over 5,000 stores, RadioShack doesn't cater to comparison shoppers, but its prices for Compaqs are competitive with those we found elsewhere.

We received helpful service from the sales staff at the store we shopped in Manhattan. By purchasing a monitor, two speakers, and a printer, as well as the primary system, we qualified for a \$100 rebate coupon. Though this hardware is covered by Compaq's one-year warranty and round-the-clock technical support, we had the option of buying a separate three-year RadioShack warranty—which covers parts and on-site labor—for only \$129 more. We could have financed our purchase as well, delaying all payments and interest charges for 90 days.

Presarios are among our favorite machines for novice buyers of home PCs, mainly because of the easy-to-follow setup poster, Internet- and multimedia-ready keyboard (with programmable application buttons), and complete

software suite. An Internet wizard sets up 50 free hours of access. Performance was a touch below similarly priced systems, but not alarmingly so.

Unlike most sellers in this roundup, RadioShack lets buyers return a system (within 30 days) for any reason, with no hidden charges. Home buyers won't go wrong with either RadioShack or Presario.—CM



Pionex P-CMU350

Cyrix MII/350, 48MB, 4GB hard disk, 2MB AGP graphics (Laguna AGP chip set), 56K modem, speakers, 15-inch Pionex MX-550 monitor, \$699.

● As you stroll the aisles with your 240-count package of Pampers at wholesale shopping warehouses such as Sam's Club, are you tempted by the low-cost PCs? Well, don't rule them out. We found that as long as you don't need much technical help before you buy, you can get a good deal.

The PC choices at Sam's included offerings from three vendors—Compaq, HP, and Pionex—with prices ranging from \$700 to \$1,000. The sales staff was friendly, although not well versed on technical

products. Our sales representative did suggest the purchase of a Lexmark printer (\$40 after rebate), which we declined.

The Pionex P-CMII350 is acceptable but not as polished as similarly priced offerings from Compaq and HP. The setup documentation is generic and not overly helpful; no ISP trial membership is offered, and the keyboard has no handy Internet or multimedia keys. The system's test performance was among the lowest in this group. In its favor, Pionex bundles family-oriented software that includes Intuit's Quicken 99 and Microsoft Encarta 99. The ESS 16-bit audio system is Sound Blaster-compatible and produced reasonable sound with the included MidiLand speakers.

Pionex offers a warranty of

one year for parts and labor, 90 days of on-site service, and lifetime telephone technical support—rare in this class. In addition, Sam's Club offers an extended warranty that for \$20 covers an additional year of parts-and-labor support. You can return systems with no restocking charge, but it must be within ten days.—**MB**



IBM Aptiva E Series 240

AMD K6-2/350, 64MB RAM, 6GB hard disk, 8MB AGP graphics (ATI Rage Pro Turbo chip set), 56K modem, speakers, 15-inch IBM C50 monitor, \$1,148. Delivery, \$96. Rebate, \$100.

● Though the machine we bought from IBM's online

store is at the high end of the price spectrum for low-cost home PCs, we were very pleased with both the buying experience and the overall value of the IBM Aptiva E Series 240 we purchased. When shopping for a PC, be sure to consider this site.

After researching offerings on its Web site, we called the company to verify the best deal. The IBM representative was courteous and knowledgeable. In subsequent calls, different IBM sales representatives provided consistent, professional service, and we were on hold for less than 1 minute per call. We selected the Aptiva 240 PC and monitor. The products were delivered three days after the expected arrival date, though we were notified of the delay by IBM's online and telephone

order tracking.

The Aptiva 240 is a great value, packed with such features as IBM's RapidAccess multimedia- and Internet-ready keyboard with speaker controls, terrific documentation installed on the hard disk, and an online Internet setup guide. Also included are IBM's ViaVoice voice recognition program with a headset from Andrea Electronics, Lotus SmartSuite, and more. The 8MB ATI Rage Pro Turbo graphics subsystem provides sufficient power for running games.

IBM provides a one-year warranty for parts and labor with free telephone technical support for hardware and software while under warranty. Systems are returnable within 30 days, with the shipping at your expense.—**MB**

SUMMARY OF FEATURES

Affordable Home PCs

PC MAGAZINE
EDITOR'S CHOICE

	Buy.Com	CDW Computer Centers	Circuit City	Compaq Works	CompUSA	Dell Refurbished Online Outlet	eMachines	Gateway Country
Sells via	Web	Web, catalog	Retail	Web	Retail, Web	Web	Web	Retail, Web
Predicted delivery time (business days)	2	3	0	7-10	8-14	5-7	0	3-5
Home setup service available (price)	☐	☐	☐	☐	■ (\$80)	☐	☐	■ (\$129)
Phone number for inquiries	888-880-1030	800-797-4239	800-251-2665	888-215-8864	800-266-7872	888-798-7561	877-566-3463	800-428-3929
Web site	www.buy.com	www.cdw.com	N/A	www.compaqworks.com	www.compuser.com	www.dell.com/outlet	www.e4me.com	www.gateway.com
Time limit for no-questions-asked refund	30 days	Varies	14 days	10 days	14 days	14 days	N/A	30 days
Restocking fee for nondefective returns	15%	15%	15%	None	15%	None	N/A	None
Product purchased	MaxTech Y2KMX1	Compaq Presario 5340	HP Pavilion 4530	Compaq Presario 2266	CompUSA American Pro AP300L-SBE	Dell OptiPlex G1	eMachines eTower 400i	Gateway Essential 400c
System price	\$500	\$803	\$599	\$429	\$599.95	\$628	\$675	\$699
Monitor size (price)	15" (\$124)	15" (\$137)	15" (\$199)	17" (\$329)	15" (\$149.95)	17" (\$199)	15" (\$130)	15" (\$180)
Processor	AMD K6-2/333	AMD K6/400	AMD K6-2/350	Cyrix M1/300	Pentium II/300	Celeron/333	Celeron/400	Celeron/400
Installed RAM	32MB	96MB	32MB	64MB	128MB	64MB	32MB	32MB
Hard disk capacity	3.2GB	4.3GB	4GB	4GB	9.6GB	4.3GB	4.3GB	4.3GB
Graphics memory size/chip	4MB S/S326	4MB S/S5595	4MB S/S5595	4MB S/S5598	4MB ATI Rage Pro Turbo AGP	2MB ATI Rage IIc AGP	4MB ATI Rage IIc AGP	8MB ATI Rage 128 vR
56K modem	■	■	■	■	■	■	■	■
Free Internet access trial included	☐	■	■	☐	■	☐	■	■
Time period	N/A	90 days	50 hours	N/A	30 days	N/A	30 days	1 year
Standard warranty on parts/labor	3 years/3 years	1 year/1 year	1 year/1 year	90 days/90 days	3 years/1 year	3 years/3 years	1 year/1 year	1 year/1 year
Term of free technical support	3 years	1 year	Lifetime	90 days	30 days	Lifetime	15 days	1 year

N/A—Not applicable. The seller does not offer this service.

FROM:
TIGERDIRECT.COM

Tiger Pro Series 233

Pentium MMX/233, 32MB RAM, 4.3GB hard disk, 2MB graphics subsystem (SiS5598 chip set), 56K modem, speakers, \$500. 15-inch Sylvania F51 monitor, \$130. Delivery, \$99.

● It's a pleasure to navigate through the Tigerdirect.com Web site. The crisp, colorful layout clearly indicates which products are in stock and their prices, and provides detailed product information. Computers are grouped by processor type, which facilitates comparing preconfigured systems or customizing one to your own preferences. Tigerdirect sells its own computers and those of its partners, including AMT

Tech, Compaq, eMachines, IBM, and UMAX.

After selecting our low-cost PC and monitor, we called sales support to confirm the specifications. The sales representative was very courteous, confirming that our selections were in stock; she could not, however, tell us what software was included. The order was a day late arriving, so we checked the Web-based order-tracking system to find out the status. The tracking program indicated that our PC would arrive the next day, and it did.

The Tiger Pro Series 233 is an ultra-low-cost system acceptable as a Web-browsing machine or for typical, light-duty home chores (word processing and the like). Faster machines are available from Tigerdirect.com at similarly

competitive prices. But the Pro Series 233 doesn't get high marks for creature comforts: The hardware is accompanied only by very generic setup documentation; the keyboard has no Internet or multimedia keys, and there is no trial ISP membership or Internet wizard. Novice buyers may be better served by home bundles from Compaq or HP.

Technical support and a parts-and-labor warranty are included for the first year. Note that Tigerdirect.com has a no-return policy (though defective merchandise can be exchanged within 30 days of purchase). If you need a basic PC at a very low cost, this Tiger machine might be worth a look. First-time buyers are better off with one of the other machines available from the fine Tigerdirect.com site.—MB

FROM:
VALUE AMERICA

Proteva AK400

AMD K6/400, 64MB RAM, 4.3GB hard disk, 8MB AGP graphics (ATI Rage Pro Turbo AGP chip set), 56K modem, speakers, \$574. 15-inch Proview PS-560 monitor, \$125. Delivery, \$68.

● Value America's Web site is a fine place to start if you are searching for a hot buy in a low-cost PC. You'll find Acer, AST, Hewlett-Packard, IBM, and Proteva brands among others. The Proteva AK400 we bought lacks the bells and whistles of the bigger-name competitors, but it's priced right.

We originally placed our order via the Web and called Value America to verify our order. The sales representative offered a special deal that was not listed on the Web site, so we took the offer for the AK400 PC and Proview PS-560 monitor. The PC arrived when promised, but the monitor arrived two days later.

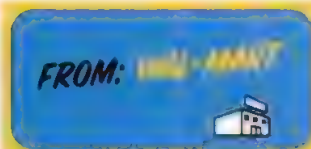
Packed into a tower case, the AK400's 64MB of RAM and 400-MHz AMD K6 processor are a good match for typical home use, and the 8MB ATI graphics subsystem means you'll even have some horsepower for games or a higher-resolution screen, should you want either. Interestingly, this was the only low-cost PC that arrived with Windows 98 Second Edition installed; no other software was included. The AK400 came with very limited documentation and no free ISP membership—a real hindrance for a beginner.

The Proview monitor powered on, but there was no video signal, giving us a great chance to test Value America's return policies. The seller pays for return shipping of defective

See www.pcmag.com for interactive views

NECX Direct	PC Connection	RadioShack	Sam's Club	ShopIBM	Staples	Tigerdirect.com	Value America	Wal-Mart
Web	Web, catalog	Retail	Retail	Web	Retail	Web	Web	Retail
3	1	0	0	7-14	0	3	1	0
☐	☐	☐	☐	☐	☐	☒ (\$99)	☒ (\$29.95)	☐
800-233-1312	800-800-5555	800-843-7422	Info not available	800-426-7235, ext. 4340	508-253-5000	800-888-4437	888-510-8285	800-966-6546
www.necx.com	www.pcconnection.com	N/A	www.samsclub.com	www.direct.ibm.com	www.staples.com	www.tigerdirect.com	www.valueamerica.com	www.wal-mart.com
Varies	Varies	30 days	10 days	30 days	14 days	N/A	15 days	15 days
15%	15%	None	None	None	None	N/A	15%	None
AcerPower 6000	Compaq Presario 5184	Compaq Presario 5070	Pionex P-CM1350	IBM Aptiva E Series 240	eMachines eTower 400i	Tiger Pro Series 233	Proteva AK400	HP Pavilion 4473
\$675	\$749	\$599	\$699	\$1,148	\$675	\$500	\$574	\$998
15" (\$188)	15" (\$159)	15" (\$279)	15" (included)	15" (included)	15" (\$130)	15" (\$130)	15" (\$125)	15" (included)
Celeron/300	AMD K6-2/380	AMD K6-2/350	Cyrus M1/350	AMD K6-2/350	Celeron/400	Pentium MMX/233	AMD K6/400	Celeron/400
32MB	64MB	32MB	48MB	64MB	32MB	32MB	64MB	64MB
4.3GB	6GB	4GB	4GB	6GB	4.3GB	4.3GB	4.3GB	5.1GB
8MB/ATI Rage Pro Turbo AGP	4MB/SiS5595	4MB/SiS5595	2MB/Laguna AGP	8MB/ATI Rage Pro Turbo	4MB/ATI Rage IIc AGP	2MB/SiS5598	8MB/ATI Rage Pro Turbo AGP	4MB/ATI Rage Pro Turbo AGP
☒	☒	☒	☒	☒	☒	☒	☒	☒
☐	☐	☐	☐	☐	☐	☐	☐	☐
N/A	90 days	90 days	N/A	N/A	30 days	N/A	N/A	50 hours
1 year/1 year	1 year/1 year	1 year/1 year	1 year/1 year	1 year/1 year	1 year/1 year	1 year/1 year	1 year/1 year	1 year/1 year
1 year	1 year	1 year	Lifetime	1 year	15 days	1 year	1 year	Lifetime

items. Returns of nondefective hardware must be made within 15 days, and you pay shipping and a 15 percent restocking fee. Value America offers a one-year on-site service warranty on parts and labor standard. For \$99 per year, you can obtain telephone technical support on all hardware and software purchases as well as software tutoring on any software—even programs you purchase elsewhere.—**MB**



HP Pavillion 4473

Celeron/400, 64MB RAM, 5.1GB hard disk, 4MB AGP graphics (ATI Rage Pro Turbo AGP chip set), 56K modem, \$998. 15-inch HP S50 monitor included.

● If you want your purchase of



a low-cost PC to be a pleasant experience—and don't need any technical help whatsoever—consider Wal-Mart. Our PC and monitor purchase took 10 minutes. We got a reasonably well-equipped HP Pavilion 4473—ideal for new users—at a good price. It wasn't the best bargain we found, but we walked away happy.

Wal-Mart now sells HP Pavilions exclusively. There was one model in stock, and we had to buy the PC and monitor as a package. When we asked about the warranty

policy and software bundle, the sales associate pointed to the stickers on the box. But he did carry our purchase to our car for us.

Like the other Pavilions we purchased, the 4473 is easy to set up, thanks to the step-by-step illustrated boxtopper and color-coded ports. The keyboard has programmable Internet launch keys so you can make use of the 50 hours of free ISP membership. The software bundle, which includes Microsoft Works and Money 99, Intuit's Quicken

Internet keys of HP Pavilions give you one-touch Web access.

99, Smith Micro's QuickLink III fax program, and HP's Financial Calculator, is geared to home offices. The Pavilion 4473's 400-MHz Celeron CPU and 64MB of RAM powered this Pavilion to the top in CPU and Winstone benchmark testing. The manufacturer's warranty covers parts and labor for one year and includes lifetime technical support via a toll-free number.

While you do not get great hardware choices or technical help at Wal-Mart, you can make a no-regrets, low-cost PC purchase.—**MB**

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SCANNING

made simple

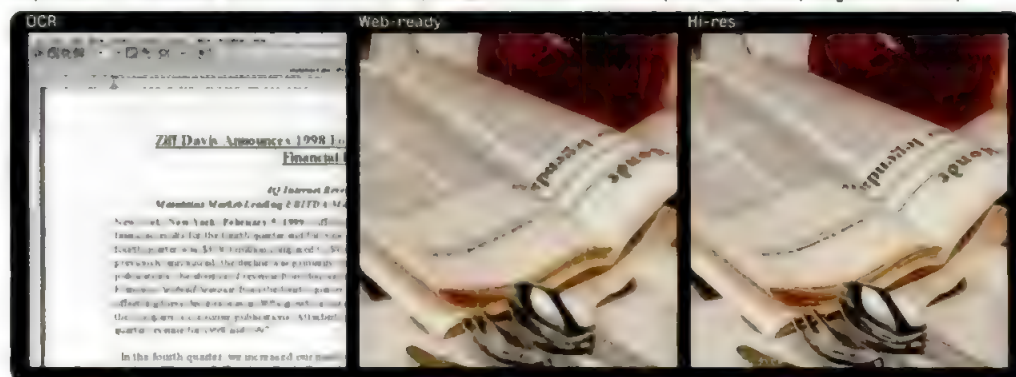
The twenty scanners we tested offer a winning combination of features, ease of use, and price. No home or small office should be without one.

By Daniel Grotta and Sally Wiener Grotta

SCANNERS HAVE BECOME ALMOST AS COMMON AS PRINTERS. MANY ARE OFFERED WITH ALLURING rebates from vendors or bundled free with PCs. That they are so inexpensive—many are well under \$100—and so easy to operate has made them a popular addition to the computer setups of both home and business users. And with good reason: Scanners offer a no-hassle means of incorporating images into your presentations, Web pages, and brochures.

The current crop of color flatbed scanners is a far cry from the units offered just last year. Most new models feature true plug-and-play setup; and for the majority of models, initiating scans is as easy as pushing a button or clicking a mouse. Only last year, half the devices we tested in our annual scanner roundup were SCSI devices, which required opening the computer, installing a SCSI board, and then going through the sometimes tortuous process of getting the driver to function properly. This time around, all but 3 of the 20 scanners *PC Magazine* evaluated have either parallel or USB interfaces. In fact, a major shakeout in the market has eliminated most manufacturers of the low-end, no-name brands that were marked by poor design and sloppy construction. Even the least expensive scanners we tested were capable of producing scans good enough for most users.

The hottest trend in scanning is the ability to push just one button to start scanning an image. The Visioneer scanners let you scan to OCR software, send your scan directly to a printer, and customize a button to produce Web-ready images automatically.



good and better



Artec 1236USB, \$100

The \$100 Artec scanner produced the output sample above. Though it scored near the bottom in all of our jury tests and its scans tend to be dull in comparison with others, it is still generally pleasing and adequate for most users.



Epson Perfection 636, \$300

Both the Perfection 636 and 636U deliver top-notch output. As evident in the sample above, color is vibrant, edges are sharp, and tonal ranges are realistic. As an added bonus, these scanners are lightning-fast.

PHOTOGRAPHY BY THOMAS CERNIAK; SCAN TARGET PHOTOGRAPHY COURTESY OF IDO*

REVIEW CRITERIA

For this roundup, PC Magazine Labs tested scanners targeted at mainstream home and business users. We asked vendors to send flatbed scanners priced under \$500 and received 20 units from 12 companies. We also tested a multifunction device, the Hewlett-Packard OfficeJet R40, for comparison. Avison and iVina declined to participate, as their new scanners would not be ready in time for testing.

Scanning used to be thought of as a "black art" that required that the user have a moderate degree of knowledge and sophistication. This year we found 13 one-touch scanners that were as easy to operate as push-and-forget-about-it fax or photocopy machines. (We also lump into this category one-click scanners without buttons that launch at a mouse click.) While some supposedly one-touch scanners actually required two steps to work properly, the one-touch feature is probably the most significant—and welcome—scanner advancement since color scanning. At its most advanced, a single click of a button on the device can automatically copy your document by sending it directly to your printer, or scan and open it in an image-editing, OCR (optical character recognition), fax, e-mail, or other specified application.

Similarly, the streamlining of the scanner interface has all but eliminated the need to know about such settings as device calibration (to match the scanner with monitor and printer), color correction (for saturation and hue), dithering pattern (for halftone scanning), adjustment of brightness and contrast levels, application of unsharpen or blur filters, and so on. Our tests demonstrated that we were usually able to achieve scans of equal or even higher quality in default mode. The technology has matured to the point where most scanner drivers are automated and optimized so that prescan adjustments are rarely

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* This image is reproduced with the permission of the International Organization for Standardization, ISO (telephone: + 41 22 749 09 47).

1. Start image editing software
2. Choose "file acquire"
3. Pre-scan page
4. Set scan area
5. Set resolution
6. Set scan mode
7. Scan page
8. Close TWAIN
9. Save file
10. Close image editing application
11. Start e-mail package
12. Start new message
13. Choose "attach file"
14. Locate saved file on hard disk

**How to scan and e-mail
a photo from their scanner.**

**How to do it
from ours.**

One small step for scanners. 13 fewer steps for you.

Let's face it, most scanners are not as simple
as they are supposed to be.

Drag and drop, plug and play,
billions of colors, and all the other
terms and specs don't make a bit of
difference when all you want to do is
e-mail a photo, scan a page of text into
your word-processor or any of the other
tasks you do countless times a day.

Visioneer OneTouch offers a simpler, more elegant
solution. It does most of the work for you, thanks to its
tight integration with the PaperPort software.

Drop in your original. Push a button. It's that easy.
Hold down a button, change a few settings, and your
scanner is practically a whole new machine.



Sure, we have all the specs
and features you expect in a
quality scanner, but we think
you'll be much more impressed
with those five friendly buttons
up front.

Visioneer OneTouch.
All scanners should be this simple.



- Printer port pass-through design
- Lift-off lid
- Includes PaperPort software
- Windows 95/98/NT 4.0 compatible

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required in most cases (in fact, the HP scanners we tested don't even have pre-scan tools). While all of the scanners produced acceptable output, some were better than others. At the higher end, the Epson Perfection 636 (\$300 street) and 636U (\$230 street) were our unanimous picks for Editors' Choice. Each offers an outstanding combination of high image quality and fast performance at a very reasonable price. The Epson Perfection 636 is commendable for graphic arts use because it ships with both a basic Twain interface for simple scanning and SilverFast, an interface with extensive, robust professional tools.

For the user on a budget, our pick is the \$130 Visioneer OneTouch 7600. This unit offers the most intuitive and flexible interface, combined with fast throughput and excellent scan quality currently available. We particularly like both Visioneer models' programmable four-button, one-touch capability, especially because the buttons can be user-defined.

A large majority of the scanners we tested are based on traditional CCD (charge-coupled device) technology. These units use a CCD semiconductor to capture and digitize your image, which is then passed through an elaborate lens-and-mirror optical system. The Artec 1236USB and Canon CanoScan FB 620U use a newer technology called CIS, or contact image sensor. CIS replaces the lens-and-mirror setup with a single row of sensors illuminated by LEDs. CIS scanners use less power and can be much thinner than CCD units, though some image quality is sacrificed (both the Artec and the Canon finished near the bottom of the pack in image quality).

Next year we expect that SCSI in this price category will be all but extinct, with USB the dominating interface. As CIS technology improves, it will likely be used in the majority of under-\$200 scanners. This will mean smaller, thinner, lighter scanners, at a lower cost. Further scanner advances will be more evolutionary than revolutionary, although we'll probably see even greater optical resolution capability—not necessarily because of improved lenses but from improvements in motor technology. For now, any one of the scanners in the reviews that follow should fill most users' needs.

editors' choice

- Sub-\$150: Visioneer OneTouch 7600
- \$150 and up: Epson Perfection 636, 636U



The scanners taking top honors in our roundup have a winning combination of features and image quality. Add the fact that they are super-simple to use, and

you'll see why the Visioneer OneTouch 7600 and the Epson Perfection 636 and 636U are our Editors' Choices. Honorable mentions go to the Mustek Plug-n-Scan 1200 ED (\$99 list) and the Canon CanoScan FB 1200S (\$500 street), both of which received high marks from our jurors and produced excellent image quality in color scans.

The Visioneer OneTouch 7600 (\$130 street) delivers exceptionally easy scanning via five one-touch buttons—Scan, Copy/Print, Fax, Custom, and Stop—that automatically send your image to the chosen application. Scans are sharp, with accurate color representation. Once you've completed your scan, you'll find the bundled PaperPort

document management software, with its drag-and-drop functionality, a pleasure to use. The price, along with its superior one-button capabilities, make the Visioneer OneTouch 7600 an ideal choice for home users.

For home or small business use, the Epson Perfection 636 (SCSI, \$300 street) and 636U (USB, \$230 street) delivered outstanding image quality and some of the fastest scan times we've ever seen. Scanned images from the Epson units were among the top choices of our jury testers, and the fine detail in the scans deserves special note. The Epson LaserSoft driver gives you the ability to use the default settings or to dive deeper into the scan process and tweak settings such as calibration and color correction.

AcerScan Prisa 620U

\$100 street. 600 x 1,200 dpi; max. scan area, letter-size; 36-bit color; USB. San Jose, CA; 800-379-3327; www.acerperipherals.com.

• Home users will find few surprises with the AcerScan Prisa 620U. The unit is easy to set up, comes with a fine selection of software titles, and delivers acceptable scans in reasonable time—with a particularly short prescan delay.

Installing the Prisa is simple, even if you only use the foldout start-up sheet as documentation. There's no one-touch button on the shell, so you'll need to launch an application to scan or copy. The user manual has a table of contents but no index; novices will have no trouble, but more demanding users will want to dig

into the online documentation of the bundled software titles. In addition to Ulead PhotoExpress 2.0 and Xerox TextBridge OCR, the scanner comes with Kai's Photo Soap2 for playful photographic image manipulation.

Our jury rated the Prisa's test images good for color fidelity, resolution, and dynamic range, with the MiraScan Twain driver on its default settings. Test scans were consistent and even, with no visible banding or posterization, though there was a bit of noticeable blurring compared with the scans of top-rated Canon, Epson, and Hewlett-Packard scanners. Though the driver's tested prescan times were very fast compared with others in the field—which is a boon when you're in a rush—the actual full-scan times were average,

Our Contributors: BRUCE BROWN, DANIEL GROTTA, SALLY WIENER GROTTA, ALFRED POOR, and M. DAVID STONE are contributing editors of *PC Magazine*, and RODERICK A. BELTRAN is an editorial researcher. S. JAE YANG was the project leader, and JENNIFER TRIVERIO was the associate editor in charge of this story.



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*Prices shown are Compaq prices, reseller and retailer prices may vary. Prices shown are subject to change and do not include applicable state and local sales tax or shipping to recipient's destination. Advertised configurations may vary from award-winning configurations. †For hard drives and storage, GB=billion bytes. ‡CD-ROM data transfer rates may vary: 24X Max from 150 KB/s to 3600 KB/s; 32X Max from 150 KB/s to 4800 KB/s. †Designed only to allow faster downloads from K56flex-compliant sources. Maximum achievable download transmission rates currently do not reach 56 Kbps, and will vary with certain line conditions. †Some restrictions and exclusions apply. Call (800) OK COMPAQ for warranty details. †Financing available through Compaq Capital Corporation (CCC) to qualified U.S. businesses, subject to credit approval and execution of CCC documentation. Monthly payments are based on 36-month Fair Market Value lease, and do not include taxes, fees, or shipping charges. Other fees and restrictions may apply and CCC reserves the right to change or cancel this program at any time without notice. †ITU V.90 modems (available on select models) are designed only to allow faster downloads from K56flex- or V.90-compliant digital sources. Maximum achievable download transmission rates are currently unknown, may not reach 56 Kbps, and will vary with line conditions. †Compaq Online Services: Free 30-day trial requires Internet access capability. ©1999 Compaq Computer Corporation. All rights reserved. Compaq, the Compaq Logo, and Prosignia are registered trademarks. MultiBay is a trademark and Better answers is a service mark of Compaq Computer Corporation. Intel, the Intel Inside Logo, and Pentium are registered trademarks and Celeron is a trademark of Intel Corporation. Microsoft is a registered trademark of Microsoft Corporation. Other products mentioned herein may be trademarks or registered trademarks of their respective companies. Operating system pre-installed on all portable products. Compaq is not liable for editorial, pictorial, or typographical errors in this advertisement. 1520/9/99

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Prosignia Internet Keyboard
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Office 2000 Small Business
Free¹ Trial of Compaq Online Services
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- Creative Labs SBS 2-piece Speakers
- nVIDIA TNTv 16MB Graphics
- Prosignia Internet Keyboard
- Microsoft Windows 98 and Office 2000 Small Business
- Free¹ Trial of Compaq Online Services
- 3-year Limited Warranty¹

\$1419*

Lease for: \$48/month¹

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- S700 17" Monitor (15.7" viewable)
- 32X Max CD-ROM Drive²
- Compaq 10/100 Network Controller
- Creative Labs SBS 2-piece Speakers
- nVIDIA TNTv 16MB Graphics
- Prosignia Internet Keyboard
- Microsoft Windows 98 and Office 2000 Small Business
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Ease of use deals with the simplicity of the hardware and software interfaces, the effectiveness of the one-touch scanning

features, and the ease with which you can fine-tune your scans.

The **image quality** of the scans is rated by both the reviewers and our jury testers. Sharp colors, smooth edges, and good contrast are important quality measures.

The **speed** rating is based on how much a given machine's scan speed differed from the group's overall standard deviation in PC Magazine Labs testing. For specific scan times, see our performance test results.

	Setup and installation	Ease of use	Image quality	Speed
AcerScan Prisa 620U	Excellent	Good	Good	Fair
Agfa SnapScan 1212U	Good	Good	Good	Fair
Artec 1236USB	Fair	Fair	Fair	Good
Canon CanoScan FB 620U	Good	Excellent	Good	Fair
Canon CanoScan FB 1200S	Good	Good	Good	Good
EDITOR'S CHOICE Epson Perfection 636U	Excellent	Excellent	Excellent	Excellent
EDITOR'S CHOICE Epson Perfection 636	Excellent	Excellent	Excellent	Excellent
HP ScanJet 4200C	Good	Good	Good	Fair
HP ScanJet 5200C	Good	Good	Good	Good (USB)
HP OfficeJet R40	Good	Good	Fair	Fair
Microtek SlimScan C6 USB	Good	Good	Good	Fair
Microtek ScanMaker X6 USB	Good	Good	Good	Good
Mustek Plug-n-Scan 1200 ED	Excellent	Good	Excellent	Poor
Mustek Paragon 1200 FS	Excellent	Good	Good	Excellent
Pacific Image ScanAce PIE-1236U	Excellent	Fair	Fair	Fair
Plustek OpticPro 12000T	Good	Excellent	Fair	Poor
UMAX Astra 2000P	Good	Good	Fair	Fair
UMAX Astra 2100U	Fair	Good	Fair	Fair
Visioneer OneTouch 5300	Excellent	Excellent	Good	Good
EDITOR'S CHOICE Visioneer OneTouch 7600	Excellent	Excellent	Good	Good

ranking seventh of the 20 units tested. Users looking for a simple, low-cost, easy-to-use scanner can choose the AcerScan Prisa 620U with confidence that they'll get their money's worth.—*Bruce Brown*

Agfa SnapScan 1212U

\$130 street. 600 x 1,200; letter-size; 36-bit; USB. Wilmington, MA; 888-281-2302; www.agfahome.com.

● The Agfa SnapScan 1212U is a fine value for its target home-user market. Though not priced to compete with the most budget-minded models, the SnapScan produces impressive results at only a slight cost premium, adding a software mix that removes the guesswork for those users who don't want to fuss with the details.

Setting up the SnapScan is quick and painless, thanks to a helpful start-up guide; you'll spend more time waiting for the bundled software to install (an automated process). There's no one-touch

button on the outer shell, but you can send a scan to a file, printer, or application with a single mouse-click. Sophisticated users who want to tweak their images may find the ScanWise driver interface a bit irritating because it doesn't show all the settings on a single screen. Paper documentation is minimal, although on-disk manuals are installed for the bundled copies of Caere's OmniPage Limited Edition (an OCR suite) and PageKeeper (for document management), and Corel Print House Magic (for image editing).

Our jury rated the SnapScan good on color and gray-scale test images, with particularly high ratings for resolution and color fidelity. Even when scanning using default settings, the unit produced smooth, consistent scans with good detail and color. The Twain driver's default Gamma settings are set a bit higher than average, which results in a slightly brighter, more

highly color-saturated image, which most people find aesthetically pleasing. But users demanding exact scans may want to make adjustments. In speed testing, the SnapScan posted an average score in the full-resolution scanning test.

Families and SOHO workers in the market for a decent, inexpensive flatbed scanner will be happy with the performance of the Agfa SnapScan 1212U.—*BB*

Artec 1236USB

\$100 street. 600 x 1,200; letter-size; 36-bit; USB. Newark, CA; 510-739-0800; www.artecusa.com.

● Based on lightweight CIS technology, the Artec 1236USB produces scans of acceptable quality and comes with an attractive price tag (\$100 street), though there are better choices—like the Mustek Plug-n-Scan 1200 ED—for the money.

Although the 1236USB has a foldout quick-start sheet, it lacks a paper manual and online help is limited. The scanner does have a one-touch button, but it does not automatically default to scanning to a file—which we found to be an unnecessary irritation. Perhaps more disconcerting to us was a lack of clear directions on how to find the required USB driver during setup, which otherwise went very quickly. Another quibble: The bundled USB cable is a mere 4 feet long, which might tempt some users to add a USB extension cable—never a good idea, but particularly ill-advised when the single cable is used for both data and power (adding an extension cable may degrade performance levels).

In our labs, the 1236USB produced generally acceptable but not outstanding scans in a slightly better-than-average amount of time. Our jury judged the Artec's color and gray-scale images fair on color fidelity, resolution, and dynamic range. In informal testing using default settings, scanned images looked a little dull compared with some of the other lower-priced scanners, such as the Mustek Plug-n-Scan 1200 ED and the Visioneer OneTouch 7600. One important note: Unless you specify a higher resolution within a target application, such as image-editing software, the Artec defaults to 72 dpi. This was not apparent from the driver or mentioned in the documentation.

Though the 1236USB has no separate power cable, the unit is a reasonable pick for novice users and is marred only by

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¹ Some 1999 Macintosh G3 systems already include a SCSI card....Bundled software and manuals on CD-ROM. All products mentioned are trademarks or registered trademarks of their respective holders. Price is United States suggested retail price. Specifications, price and software bundles are subject to change without notice. SMA999

PERFORMANCE TESTS

Flatbed Scanners



The Epson Perfection 636 and 636U reigned in this roundup, with the best all-around image quality; the Canon CanoScan FB 1200S produced the best Web content.

But the most impressive value came from the inexpensive pair of Visioneer OneTouch scanners—most notably the excellent Visioneer 7600.

We subjected this year's scanners to a suite of inspection tests that isolate and evaluate the optical system, the precision of the mechanical parts, the inherent noise in the internal circuitry, and the noise's effect on the overall scan quality. But most important to us was our jury's opinion, because scanned images must ultimately please human eyes. In addition to visual testing, we also

measured the relative speed of the scanners and tested their optical character recognition (OCR) performance.

We designed our jury tests to help us evaluate how well the scanners produced typical digital images (300-dpi TIFF or 72-dpi JPEG files). Our low-level measurements were devised to push the scanners to their mechanical and optical limits. For our objective tests, target images were scanned at the scanner manufacturer's rated maximum optical resolution, in gray scale. Scanners that performed well generally fared equally well in the eyes of our jury. One of the few exceptions was the Canon CanoScan FB 620U, which produced good numbers in low-level measurement but fared very poorly with our jurors.

For the **Color Photo Printout** jury test, jurors looked for full dynamic range, precise optical resolution, and accurate colors. A good score indicates suitability for higher-end graphics used in producing print media or CD-ROMs. The Mustek Plug-n-Scan 1200 ED received excellent marks in all three categories (dynamic range, resolution, and color). The Agfa SnapScan 1212U, Epson 636 and 636U, and Microtek SlimScan C6 USB were rated almost as well. The Canon 620U produced images that were too dark for our jury's liking and ended up at the bottom of the pack. Canon claims the problem is caused by Windows 98's Plug-n-Play feature, which fails to associate the color profile properly for the

JURY TESTS									
▲ High scores are best. ▼ Low ranks are best. Bold type denotes first place. ■ denotes Editors' Choice.									
	Maximum optical resolution (dpi)	Web Rank ▼	Score ▲		Color Photo Printout Rank ▼	Score ▲		Gray-Scale Printout Rank ▼	Score ▲
AcerScan Prisma 620U	600 x 1,200	16	35.2		17	17.9		17	9.0
Agfa SnapScan 1212U	600 x 1,200	14	36.4		2	24.5		3	14.7
Artec 1236USB	600 x 1,200	19	33.6		16	19.0		15	10.1
Canon CanoScan FB 620U	600 x 600	N/A	N/A		N/A	N/A		N/A	N/A
Canon CanoScan FB 1200S	1,200 x 1,200	1	46.9		6	24.0		14	11.0
■ Epson Perfection 636U	600 x 2,400	8	41.7		5	24.3		1	15.3
■ Epson Perfection 636	600 x 2,400	3	44.6		2	24.5		2	16.2
HP ScanJet 4200C	600 x 1,200	11	39.3		14	20.2		13	11.1
HP ScanJet 5200C	600 x 1,200	2	45.8		8	23.8		6	13.4
HP OfficeJet R40	600 x 2,400	17	34.6		15	19.8		8	12.4
Microtek SlimScan C6 USB	600 x 1,200	9	40.6		2	24.5		9	12.3
Microtek ScanMaker X6 USB	600 x 1,200	6	42.0		11	22.0		10	12.0
Mustek Plug-n-Scan 1200 ED	600 x 1,200	5	42.1		1	24.8		7	12.5
Mustek Paragon 1200 FS	600 x 1,200	12	37.1		10	22.2		18	8.8
Pacific ScanAce PIE-1236U	600 x 1,200	15	36.1		11	22.0		5	13.6
Plustek OpticPro 12000T	600 x 1,200	13	37.0		13	20.8		16	9.4
UMAX Astra 2000P	600 x 1,200	18	34.0		18	17.4		12	11.5
UMAX Astra 2100U	600 x 1,200	10	39.7		19	16.0		19	8.4
Visioneer OneTouch 5300	300 x 600	4	44.4		9	22.3		4	13.9
■ Visioneer OneTouch 7600	600 x 1,200	6	42.0		6	24.0		11	11.9

▲ The Mustek 1200 ED aced our tests for scanning color photos. The Agfa, Epson 636 and 636U,

and Microtek C6 USB were rated nearly equal to the Mustek unit with regard to color scans.

▲ The two Epson entries were almost indistinguishable from each other, but both stood out

from the rest. The Agfa was recognized as the next-best, with especially good gray-scale output.

minor gaps in documentation and design.—BB

Canon CanoScan FB 620U, FB 1200S

620U: \$130 street. 600 x 600; letter-size; 36-bit; USB.
1200S: \$500 street. 1,200 x 1,200; letter-size; 36-bit; SCSI.
Costa Mesa, CA; 800-652-2666; www.canoscan.com.

● Canon's two entries in this group cover the top and the bottom ends of the con-

sumer price range. The Canon CanoScan FB 1200S is the more sophisticated device; it comes with strong software and delivers excellent scans that will satisfy higher-end users. The Canon CanoScan FB 620U uses simpler software aimed at the home and small-office user; it produces acceptable but not exceptional scan quality.

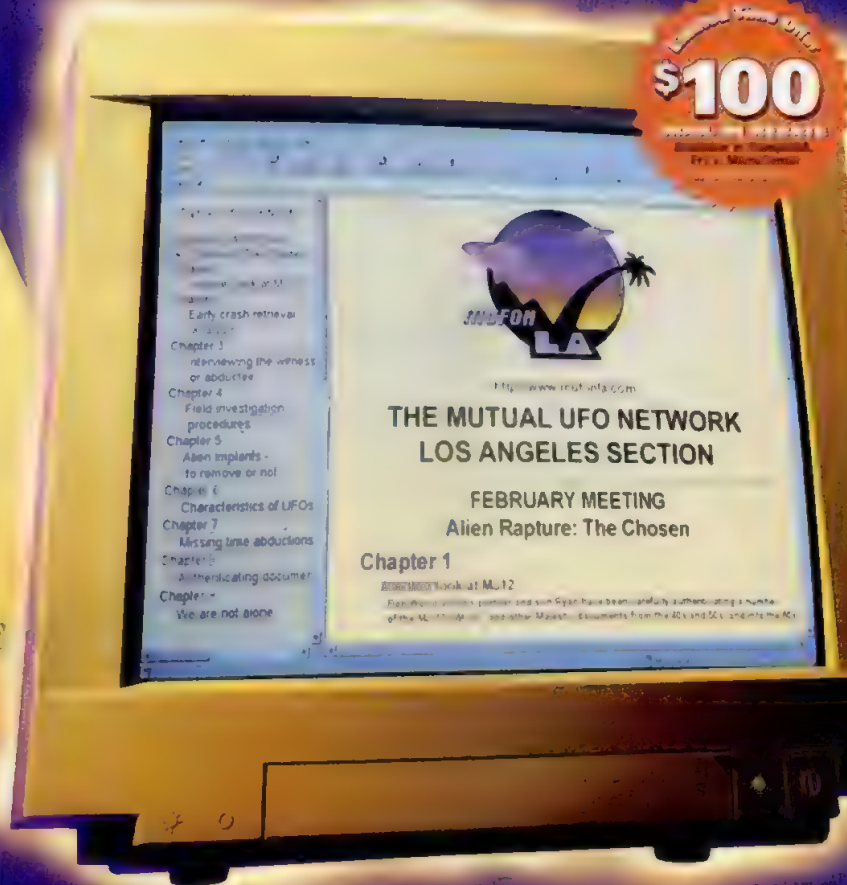
Both units are easy to set up and use,

and both come with Canon's ScanGear software, which includes a true one-touch interface activated by a button on the scanner itself. The button can be configured to complete a scanning task automatically, without any user intervention at the keyboard. Each scanner also has a more sophisticated Twain-compatible driver interface for use with Windows applications.



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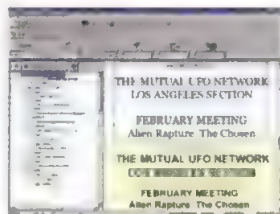
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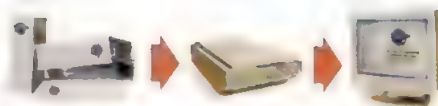
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PERFORMANCE TESTS

Canon scanner. Our own investigation was inconclusive, but we did notice a glitch in the Canon 620U's installation process: The install script halts unexpectedly when it's about to load an ICC file. Canon recommended a manual fix that yielded much better images; this fix will soon be available on the company's Web site.

High scores on the **Gray-Scale Printout** jury test indicate accurate reproduction of details and of pixels' brightness levels. Our jurors found the two Epson entries almost indistinguishable from each other, and both clearly stood out from the rest. The Agfa 1212U was recognized as the next-best. The Canon 620U's dark scan was, like its color scan, the jury's least favorite.

The Canon 1200S was the unmistakable winner on the **Web** jury test, which is less resolution-intensive than most. The 300-dpi Visioneer OneTouch 5300 finished fourth on this test, behind the HP ScanJet 5200C and Epson 636.

A good indicator of a scanner's ability to capture details is its optical **Resolution**. The 1,200-dpi Canon 1200S scored the best on this test, resolving 12 line pairs per millimeter. The Agfa, the Artec 1236USB, and the Canon 620U all resolved 10 line pairs per millimeter. The two Visioneer units could distinguish only 5 line pairs per millimeter.

The **Color Registration** test measures the accuracy of the alignment of the CCD or CIS array's red, green, and blue planes. Upon close inspection, a rainbowlike halo (technically referred to as a chromatic aberration) is visible next to fine lines on scanners with poor registration. The results of this test, presented in pixels,

describe the maximum distance between any two misaligned planes. The Microtek ScanMaker X6 USB and the Visioneer 7600 were the most impressive, with a maximum misregistration of 1/10 of a pixel or less. Most scanners performed adequately, except for the Canon 1200S and the Pacific Image ScanAce PIE-1236U, which produced misregistration of more than a full pixel. However, the Canon unit scans at a higher resolution (1,200 dpi), so each pixel is much smaller than other scanners' equivalents.

To perform well on the **Uniformity** test, a scanner must render consistent brightness over the entire surface of a gray letter-size target. The score is derived by dividing the highest brightness level by the lowest; an ideally uniform scanner would achieve a score of 1. The Canon 620U, the Mustek 1200 ED, and the Pacific Image had the highest nonuniformity, with the brightest spot 5 or 6 percent brighter than the darkest.

Noise on an image can arise from contamination of the scanner's platen or from internal electric noise in the circuitry. We measured noise levels by comparing the standard deviation of gray levels in the original test target against that of the scanned copy. We consider a score of 2 or lower to be excellent, and 4 or below to be acceptable. Only one scanner, the Pacific Image, failed, with a noise level of 5.81.

To test **Speed** we timed each unit scanning a letter-size color target at 300 dpi in 24-bit color. The time we report for each scanner includes both the prescan and the fine-scan stages. The two Epson scanners and the Mustek Paragon 1200 FS stood out from

the pack, requiring less than 40 seconds. The Plustek OpticPro 12000T and the Mustek 1200 ED were the two slowest.

For the **OCR Errors** test, we report the number of errors found in a test file produced by the scanner's OCR software. Each misspelled word, missing space, or misplaced carriage return counted as an error; files with more than 25 errors were deemed useless. Only 2 scanners, the HP 5200C (using Caere OCR) and the Visioneer 5300 (using Visioneer's own package) failed this test.

Special thanks to Yair Kipman of KDY Inc. (www.imagemexpert.com) and Glenn Menin for technical consultation on test methodologies and data analysis. —Analysis written by S. Jae Yang

PERFORMANCE TESTS

▲ High scores are best.

▼ Low scores are best.

Bold type denotes first place.

■ denotes Editors' Choice.

	Resolution (line pairs/ mm) ▲	Color Registration (Pixels) ▼	Uniformity ▼	Noise ▼	Speed Test ▼	Speed Rating	OCR Errors ▼
AcerScan Prisa 620U	9	0.64	1.02	2.17	1:25	Fair	0
Agfa SnapScan 1212U	10	0.85	1.01	2.38	2:46	Fair	0
Artec 1236USB	10	0.74	1.01	2.11	1:18	Good	0
Canon CanoScan FB 620U	10	0.60	1.05	1.91	1:24	Fair	4
Canon CanoScan FB 1200S	12	1.25	1.02	1.99	1:04	Good	2
■ Epson Perfection 636U	8	0.47	1.01	1.82	0:39	Excellent	1
■ Epson Perfection 636	7	0.32	1.01	1.53	0:39	Excellent	1
HP ScanJet 4200C	9	0.46	1.02	2.54	1:26	Fair	2
HP ScanJet 5200C	9	0.52	1.03	2.31	1:18 (USB)	Good	Fail (>25)
HP OfficeJet R40	8	0.49	1.02	1.54	1:56	Fair	3
Microtek SlimScan C6 USB	9	0.31	1.03	1.80	2:10	Fair	1
Microtek ScanMaker X6 USB	8	0.08	1.01	1.73	1:15	Good	2
Mustek Plug-n-Scan 1200 ED	8	0.83	1.06	2.16	4:17	Poor	0
Mustek Paragon 1200 FS	8	0.22	1.01	1.96	0:38	Excellent	0
Pacific ScanAce PIE-1236U	9	1.17	1.05	5.81	1:23	Fair	4
Plustek OpticPro 12000T	6	0.27	1.01	3.16	5:29	Poor	0
UMAX Astra 2000P	8	0.80	1.03	2.16	2:09	Fair	3
UMAX Astra 2100U	8	0.52	1.03	2.04	2:16	Fair	1
Visioneer OneTouch 5300	5	0.22	1.01	1.53	1:06	Good	Fail (>25)
■ Visioneer OneTouch 7600	5	0.10	1.01	1.79	1:11	Good	0

Novices will like the simple USB connection of the 620U, which allows for quick installation, as well as the simple bundled software, which includes Adobe PhotoDeluxe Home Edition for imaging and Xerox TextBridge Plus for OCR. But before we were able to get the scanner working correctly, we had to resolve a problem that sometimes occurs with Windows 98 installations, whereby the color

profile fails to be registered correctly, resulting in images that are too dark. (A downloadable fix for this problem should be available on the CanoScan Web site by the time you read this.)

Once it was correctly installed, the 620U produced quality scans. In our labs, images showed good tonal range and excellent detail, even in shadow and high-light regions. On our speed tests, the

620U was only a mediocre performer, earning a fair rating from our jurors and reviewers. Still, the 620U is a good value for the money.

The higher-end 1200S features Canon's own Variable Refraction Optical System (VAROS), which lets the device scan at half the pixel pitch of the sensor array. By changing the angle of an internal glass plate, the scanner can shift the



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And something about Mary

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focus of the sensor array by a half-pixel, delivering 1,200- by 1,200-dpi optical resolution using a less expensive, 600-dpi sensor array, effectively filling the gaps between the sensors. The unit can also support two add-on options: an automatic document feeder (\$430 street) and a film adapter unit for transparencies and negatives (\$280 street).

This SCSI-based device is somewhat more complicated to install than its home-oriented sibling. It requires that you first open the computer case and locate an available PCI slot for the Adaptec SCSI card. Bundled software includes the same TextBridge Plus package as the 600U, but for image editing the 1200S comes with the more powerful Adobe Photoshop 5.0 LE.

The 1200S produced some of the best images in this roundup. Even using the default settings, scans showed no sign of banding and had excellent color and detail. Fine detail was also evident in both shadows and highlights, and even skin tones came out lifelike and smooth. The unit was also a faster-than-average performer.

Both of these Canon scanners are good choices. But if you want the most for your money, then the 1200S is the one to pick.—*Alfred Poor*

Epson Perfection 636, 636U

636U: \$230 street. 600 x 2,400; letter-size; 36-bit; USB.
636: \$300 street. 600 x 2,400; letter-size; 36-bit; SCSI.
 Torrance, CA; 800-463-7766; www.epson.com.



Earlier versions of Epson scanners have combined impressive hardware with sometimes marginal software. With the Epson Perfection 636 and 636U, however, Epson has finally got it right. These two scanners are aimed at overlapping markets—the 636U at educational, home, and SOHO users, and the 636 at entry-level graphics users in SOHO environments.

Unless you already have a SCSI adapter, setting up the Perfection 636 involves removing the computer case and installing the supplied card. Otherwise, installation is hassle-free. A minor wrinkle: The scanner comes with two Twain drivers, but our winning jury scores were based on scans using the simpler driver.

PC EDITORS' HOT LINKS

www.pcmag.com/hotlinks

Visit PC Magazine Online and compare output samples from the top contenders in this roundup. Then check out these helpful sites.

► Introduction to Imaging

http://www.gli.getty.edu/intro_imaging/
 From the basic "What is a digital image?" to discussions on dynamic range and resolution, this helpful site offers a wealth of information on capturing and using images.

► The PC Technology Guide: Scanners

<http://www.pctechguide.com/18scanners.htm>
 This useful page provides in-depth information on the technology behind scanners, including interpolation, scan resolutions, and Twain drivers.

The driver interface is largely self-explanatory, with few controls beyond auto-exposure and the ability to pick from a list of (mostly Epson) printers to match to. If you want additional controls, you'll find them in the advanced LaserSoft driver. You'll also find a typical assortment of bundled software in the package, including Adobe's PhotoDeluxe Business Edition 3.0, Broderbund PressWriter, and Xerox TextBridge 3.0.

The 636U won top honors for image quality on our tests, with a first-place jury ranking for printed gray-scale output and an eighth-place ranking for viewing on-screen. Colors both on-screen and in the

printed output were vibrant, and they matched the original reasonably well. The scan of the monochrome test photo retained almost the full dynamic range of the photo from black to white. Just as important, the scans retained even tiny details of the original, which supports Epson's claim to offer better optics than most of its competition. Scan speed was excellent—indeed, both Epson units were among the fastest in the roundup.

The 636U is almost identical to the 636, except that it connects via a USB port and comes without the extra advanced driver (as is appropriate for its target audience). Its USB port makes the 636U even easier to set up than the 636, and the basic driver has all the same features and ease of use, including the monitor calibration function and the same choice of printers to match the scanner to. Its software bundle is a little different, with Adobe PhotoDeluxe Home Edition 3.0 and Newsoft Presto! Page Manager.

Given the commonality of hardware and software, it's not surprising that the 636U and 636 scored similarly on our jury tests. The 636U managed a virtual tie for first place for printed output and wasn't far behind for on-screen viewing, achieving eighth place in a closely packed field.

As should be clear, both of these scanners offer winning combinations of hardware and software. Either will give you high-quality scans with a minimum of effort. The 636 offers the additional benefits of more control over your scans and more sophisticated OCR software, albeit at a slightly higher price.—*M. David Stone*



The Perfection scanners are not only easy to install but offer superior output and speed.

HP ScanJet 4200C, ScanJet 5200C, OfficeJet R40

ScanJet 4200C: \$200 street. 600 x 1,200; letter-size; 36-bit; USB. **ScanJet 5200C:** \$300 street. 600 x 1,200; letter-size; 36-bit; USB and parallel. **OfficeJet R40:** \$600 street. 600 x 2,400; letter-size; 30-bit; parallel port. Palo Alto, CA; 800-752-0900; www.hp.com.

● Hewlett-Packard's three entries are well suited to small businesses and beginners who need basic graphics capability. The entry-level HP ScanJet 4200C is targeted directly at home office users, while the ScanJet 5200C is positioned for business graphics professionals. Both are remarkably easy to operate, though more advanced users will be frustrated by their

HARDWARE

Desktop Scanners

almost complete lack of standard prescan tools and documentation. The multifunction HP OfficeJet R40, which shares many of the same components—and limitations—as its ScanJet companions, will satisfy the needs of most budget-minded small offices.

All three scanners come bundled with HP's straightforward, easy-to-use PrecisionScan driver. The interface presents users with only four simple options: Start New Scan, Scan Destination (which selects between applications), Make

5200C has only one (Scan). But the 5200C is designed for heavier use and can accommodate an optional automatic document feeder (\$200 street).

In our labs, scans from the 4200C tended to be dull and flat. There were virtually no highlights, and we saw severe clipping in the shadows. Detail was reasonable, but the lack of contrast marred sharpness and made colors appear washed out. The 4200C earns a score of *fair* for image quality on our PC Magazine Labs Scorecard.

The 5200C did better with our jury, scoring second-highest on our Web-based test, and was the sole HP scanner to earn a score of *excellent* for image quality. In our labs, scans from the 5200C displayed accurate, pleasing and well-saturated colors, especially in skin tones. Scans came through clean, with no artifacts or skewing, and detail was readily discernible. We saw good tonality in the midrange and highlights, though the lack of true blacks meant reduced contrast and made images seem less sharp or crisp.

Despite the 5200C's ability to deliver good-looking scans, we cannot recommend it for serious graphics users because of its simplistic interface. But as with the more entry-level-oriented 4200C, this limitation may mean little, since most customers will likely want quick and easy scans. For these users, either model will fill the bill.

Incorporating the same scanner engine and interface as the 4200C and 5200C, the HP OfficeJet R40 multifunction device enjoys the same advantages and suffers from the same deficiencies as its ScanJet siblings. The R40 will find a ready home in SOHO and corporate offices that need an all-in-one peripheral capable of scanning, printing and faxing.

With a control panel and a variety of buttons on the outer shell of the unit, the R40 functions well as a one-touch scanner and photocopy machine. For photocopying, it offers a variety of controls, including settings to enlarge or reduce, lighten or darken, increase or decrease color saturation, change the number of copies, and specify best, normal, or fastest scanning mode. For straightforward document or image scanning, the R40 employs the same easy-to-use (and impossible-to-adjust) PrecisionScan

interface. The unit is slower than the other HP scanners, since the single button on its shell merely opens up the interface and doesn't perform or complete any function.

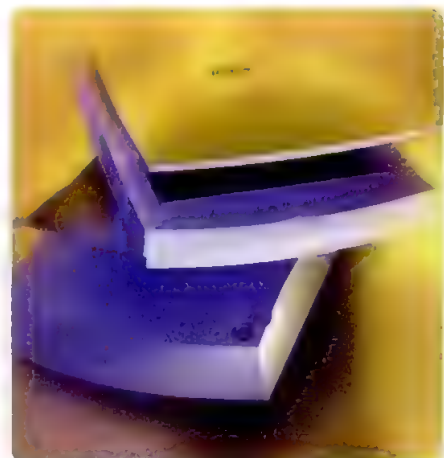
HP boasts that the R40's photo-quality printer produces top-quality output, but we didn't test this in our labs. All of the R40's scans were jury-tested using our standard test-bed printers, so our results apply only to the scanner itself. These results showed uniformly underexposed scans, despite significant clipping in the shadows. Highlights were very good, colors were relatively accurate, and skin tones were differentiated though not really pleasing. Images tended to be dull and dark, and lacked detail and crispness.

The R40 is a business productivity tool that delivers serviceable scans along with printing and fax capability. It will be useful for offices with limited space and modest budgets. The two ScanJet models, meanwhile, are well suited for entry-level and SOHO consumers.—*Daniel Grotta and Sally Wiener Grotta*

Microtek SlimScan C6 USB, ScanMaker X6 USB

SlimScan C6 USB: \$100 street. 800 x 1,200, letter-size, 36-bit, USB. **ScanMaker X6 USB:** \$149 list. 600 x 1,200, letter-size, 36-bit, USB. Redondo Beach, CA; 800-654-4160; www.microtekusa.com.

● The Microtek SlimScan C6 USB and ScanMaker X6 USB are intended for home and SOHO applications. Both are inexpensive and easy to use, making them well suited to novice users, though the image quality of the two units is suffi-



The SlimScan C6 (top), among the thinnest units in this roundup, is based on CIS technology.



The HP ScanJet 4200C and 5200C are well-suited to home offices and small businesses.

Optional Adjustments (for output type, border selection, and output size), and Send the Scan Now. The only manually selectable parameter is resolution. The preview window is zoomable but not reliable for color matching; all three scanners are sRGB-compliant and take their color profiles directly from Windows, however, so theoretically, no prescan calibration is necessary. Although all three scanners can also autodetect and set the type of original, in our labs none could *de-screen* printed material (blur the detected dots and half-tones to achieve a smooth, faithful reproduction).

Each of the three scanners ships with a comprehensive software bundle, but only a single sheet of documentation. We'd like to see more extensive instructions and explanations of the scanning process.

The two ScanJet models are based on traditional designs and are well suited to beginners and less-demanding office users. The 4200C is smaller than the 5200C, and it has three buttons on its shell (Scan, Copy, E-mail), whereas the

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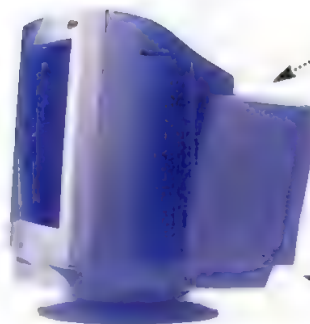
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CTX

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speeds & feeds

When you're trying to decide which scanner to buy, one of the key choices to make is the interface for connecting the scanner to your PC. When you choose a scanner be aware, as our tests show, that the type of interface doesn't tell you much about performance—particularly when choosing between USB and SCSI on the one hand and USB and parallel port on the other.

This conclusion jumps out most clearly with USB, an interface used by the fast and slow contenders alike in this roundup. A good example: Scans from the UMAX Astra 2100U, one of the slowest, took more than three times as long as those from the Epson Perfection 636U, one of the fastest. Both are USB scanners.

Our tests also show that USB can match SCSI for scan times. According to Epson America, the USB-based Perfection 636U and the SCSI-based Perfection 636 differ only in their interfaces. Comparative testing in our labs, using virtually identical drivers, yielded scan times that differed by only 0.6 seconds. Similarly, some parallel-port scanners were significantly faster than some USB scanners, with the faster parallel-port scanners taking about 1 minute and the slowest USB scanner taking over two.

There's a stronger correlation between connection and speed than these observations suggest, because vendors tend to put SCSI connectors only on fast scanners and parallel ports on slow scanners. Ultimately, the most important factor for picking one interface over another may be ease of setup. USB and parallel both make setup easy, though USB has a slight edge, because it obviates a pass-through cable to accommodate your printer. A SCSI port can be almost as easy, if you already have a SCSI card in your system. If not, you'll have to take the case off your computer to install the card. Also, SCSI scanners tend to be more expensive, in part because they usually include a SCSI card.—*M. David Stone*

cient for many business tasks.

Both scanners include the same comprehensive driver and software bundle. Microtek's own ScanSuite is activated by a single button on the scanner that lets you route output to a file, to a printer (for making copies), or to a fax program. The more versatile ScanWizard is a Twain-compatible driver easy enough for most novices to use, but it also provides access to a wide range of detailed image-quality controls that will satisfy more sophisticated consumers. And the software bundle provides for image editing (Ulead PhotoImpact and Adobe PhotoDeluxe), OCR (Caere OmniPage Limited Edition), document management (Caere PageKeeper Standard), and projects (pix.com PictureFun!).

One of the few flaws in the installation procedure for both scanners is that the quick-start instructions direct you to

load the driver software before you insert the CD-ROM in your system—even though the driver is itself on the CD. This might cause confusion in novices. Also, the markings on the scan deck of the ScanMaker X6 USB suggest that the original should be centered on the glass, yet the software assumes that it will be placed in the upper left-hand corner.

The SlimScan is truly tiny, thanks in part to its contact image sensor (CIS) technology. Though it can scan a full letter-size page, it weighs less than 8 pounds, which may tempt some users to pack it along with a notebook when traveling. Installation and setup are a snap, thanks to the USB connection. (Microtek also offers a parallel-port version.)

In our labs, images from the SlimScan were generally attractive though a bit lower in quality than the best in this roundup. Color images had a tendency to be a bit washed out, and skin tones were often posterized. Colors were clipped a bit at the low end of the spectrum, losing some details in shadowed areas, and some light banding was apparent. Images

were on the whole slightly blurred, but still serviceable for many uses.

The ScanMaker costs only a bit more than the SlimScan, but it produced much better results. Scans rivaled those from units costing twice as much, with no apparent banding and smooth gradients even on skin tones. There was good detail in both shadow and highlight areas, and images were crisp and clear.

Despite minor glitches in the installation routine and documentation, these two scanners stand out for their ease of use. But while the SlimScan delivers adequate scans, its slow speed rating makes it easier to recommend the ScanMaker—which also has a slight edge on image quality.—*AP*

Mustek Plug-n-Scan 1200 ED, Paragon 1200 FS

Plug-n-Scan 1200 ED: \$99 list. 600 x 1,200, letter-size, 30-bit, parallel port. **Paragon 1200 FS:** \$299 list. 600 x 1,200, legal-size, 36-bit, SCSI. Irvine, CA; 949-788-3600; www.mustek.com.

● These two new scanners from Mustek are aimed at different markets, and they produced widely divergent results in our labs. The Mustek Paragon 1200 FS is an affordable, legal-size scanner aimed at SOHO and service bureau users; its problematic scan quality makes it a questionable choice for its intended market. The less expensive Mustek Plug-n-Scan 1200 ED is a consumer-oriented, letter-size device that delivers much better output; it's well worth considering for anyone in search of a low-priced scanner.

The Plug-n-Scan's installation routine



The Plug-n-Scan 1200 ED outpaces the Paragon 1200 FS when it comes to image quality.

Low scores are best.
Bold type denotes first place.
■ denotes Editors' Choice.

	Interface	Speed Test (minutes:seconds)	Speed Rating
AcerScan Prisa 620U	USB	1:25	Fair
Agfa SnapScan 1212U	USB	2:46	Fair
Artec 1236USB	USB	1:18	Good
Canon CanoScan FB 620U	USB	1:24	Fair
Canon CanoScan FB 1200S	SCSI	1:04	Good
Epson Perfection 636U	USB	0:39	Excellent
Epson Perfection 636	SCSI	0:39	Excellent
HP ScanJet 4200C	USB	1:26	Fair
HP ScanJet 5200C	USB	1:18	Good
HP OfficeJet R40	Parallel	1:56	Fair
Microtek SlimScan C6	USB	2:10	Fair
Microtek ScanMaker X6	USB	1:15	Good
Mustek Plug-n-Scan 1200 ED	Parallel	4:17	Poor
Mustek Paragon 1200 FS	SCSI	0:38	Excellent
Pacific ScanAce PIE-1236U	USB	1:23	Fair
Plustek OpticPro 1200T	Parallel	5:29	Poor
UMAX Astra 2000P	Parallel	2:09	Fair
UMAX Astra 2100U	USB	2:16	Fair
Visioneer OneTouch 5300	Parallel	1:06	Good
Visioneer OneTouch 7600	Parallel	1:11	Good

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Keeping key documents safe and on the move

Titus Grain Inspection, Inc.

As federally-licensed grain inspectors, Titus Grain Inspection, Inc. in West Lafayette, IN, works with farmers, grain elevators and a variety of food processing companies to ensure the quality of grain products bought and sold out of mid-Indiana. The company must conduct quality-control tests and submit particular kinds of documentation to buyers and government agencies.

Often paperwork sent by Titus upon completion of its inspections is a key requirement for payment to all involved. That's where WinFax PRO™ has made a big difference, since the company's headcount stands at just five people.

"We now fax the paperwork needed so the sellers can get their cash advance right away," explains Douglas Titus, assistant manager and computer specialist. "We used to overnight it, but faxing it means faster payment. And WinFax has saved us plenty of time because we can do it straight from the computer."

As more and more of Titus' communications are conducted by electronic mail and over the Internet, the firm has also come to depend on Norton AntiVirus™.

"I've been using Norton AntiVirus for a very long time and I like it better than any other anti-virus product on the market," says

Titus. And you know what? We've never had a problem with a virus."

The versatile Norton Utilities™ software has also helped the company

"We use a number of highly-specialized, custom-built programs and they sometimes have a tendency to crash our computers," Titus notes. "With CrashGuard™, we can minimize the effects of that and keep from having to reboot. CrashGuard can also help us figure out what's creating the conflict so we can prevent the problem from happening over and over again."

The disk optimizer in Norton Utilities is popular, too. "I use it almost every day, especially on our older systems where disk fragmentation can really slow down performance. And I like CleanSweep™ because we take a lot of documents off of FTP sites and our hard drives fill up fast. CleanSweep makes it easy to get rid of the stuff we don't need anymore. If I make a mistake and need to keep something I've dumped, it's easy to retrieve it."

"We had lightning damage that wiped out everything, even in the CMOS. But Norton Utilities was able to restore it and we were back up and running fast."

Ready for Year 2000

C.W. Cook Co.

Concerned about your system going down or losing data when the clock strikes midnight on December 31, 1999? With the imminent arrival of the Y2K bug, many savvy small business professionals are testing their systems proactively to prepare for the big day.

"Although we investigated different products, Norton 2000™ won hands down," says Claudia Cook, Information Systems Director for C.W. Cook Co., a busy, family-owned civil engineering, land surveying and land planning firm.

Norton 2000 audits applications against a database of known Year 2000 problems and gives a comprehensive report on its findings. It also tests

the system's BIOS, real-time clock, and system clock, fixing many of the problems it discovers.

"It was great because the reporting aspects are very specific. It takes you right to the line of code where the problem is and gives you a report. I can give that report to the director of the department and say 'We need to fix this problem.' With other products we had to trust that it fixed the problem, and I'm not into that," reports Cook.

"If Norton 2000 finds that there is a problem with the printer driver, for example," she says, "it takes you directly to that manufacturer's Web site where you can get a new driver. So, even if Norton 2000 can't fix something, it tells us about problems with other vendors' software and we'll contact them for a solution."

Maximum client contact for minimal cost

Capital Financial Services

"When I started this firm in 1995, we needed computer software that would help us develop and manage our client base," recalls J.C. Stadler, founding partner of New Jersey-based Capital Financial Services Corp. "I knew that personal contact with our clients was essential, but money was tight and I didn't want to spend a fortune on software."

According to Stadler, he found the solution he needed with ACT!™ software.

"ACT! gives us added flexibility and it works with both sides of our business. In one database, we can manage both our financial and accounting clients. Our whole marketing effort is centered around our ACT! database," he says.

For example, the firm uses ACT! to track when they mail an introductory letter to a new contact. They also schedule ACT! to remind them to follow-up on that contact two weeks after the letter goes out.

ACT! is also the company's scheduling software.

"The first thing our receptionist does every day is print out the schedule for the day, which includes any calls that need to be made, mailings to go out and any other to-do items."

"Another benefit with ACT! is how easily it integrates with Symantec's other products. Stadler likes to work from home two days a week. But, if a client calls, he wants to be available to them. In order to do this, he uses pcAnywhere™ from his home computer to access the ACT! database at the office and download any other files he needs. If he meets with a client, he takes notes on his laptop and, using WinFax PRO, faxes his notes into the office, where the receptionist inputs them into the ACT! database.

Of course, at the end of the day, the issue is still whether or not the clients are satisfied, and ACT! makes that happen.

It's no wonder then, that Stadler calls ACT! his firm's "most valuable asset."



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TalkWorks PRO is the most powerful voice mail software ever created. It's the only one that can manage your entire business, from client contacts to appointments, and even your calendar.

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Norton AntiVirus is the most powerful virus protection software ever created. It's the only one that can manage your entire business, from client contacts to appointments, and even your calendar.

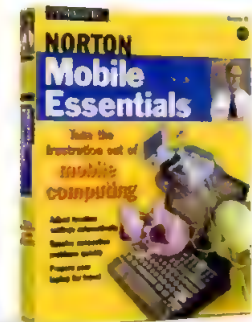
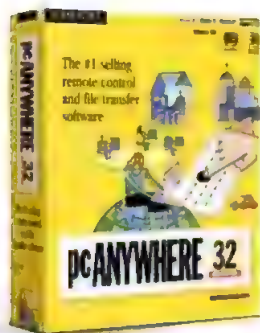
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Norton Utilities is the most powerful system maintenance software ever created. It's the only one that can manage your entire business, from client contacts to appointments, and even your calendar.

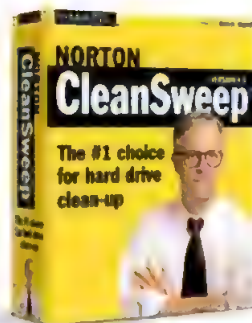
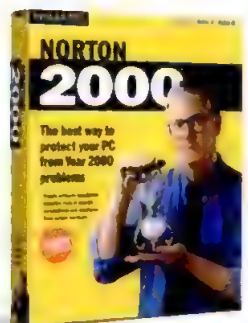
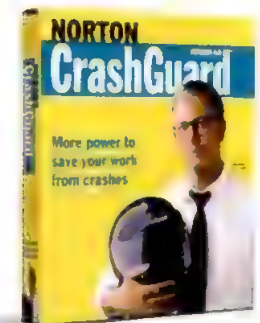
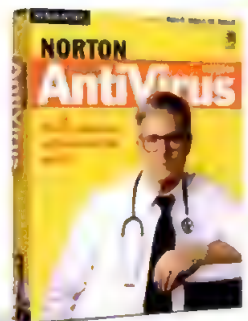
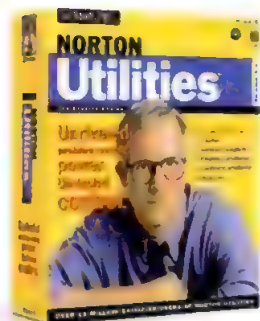
Norton 2000

Norton 2000 is the most powerful system maintenance software ever created. It's the only one that can manage your entire business, from client contacts to appointments, and even your calendar.





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is quick and painless, and the driver interface manages to be more attractive than standard Windows programs without violating Windows conventions. You'll find a number of useful, easy-to-use features, including an emboss filter and an unsharpen mask. The driver can enhance the color depth of scans to 48 bits, and can hand off the 48-bit scan to the included image-editing software. On our tests, however, the 24-bit scans produced better color.

During jury testing, the Plug-n-Scan posted excellent scores in our jury testing—topping the field in the color photo printout. The printed versions also showed a slight loss of the subtle shading that gives rounded objects a three-dimensional effect. Monochrome photos lost a bit of dynamic range, with whites dulled down toward gray and some highlights missing. Scan speed was surprisingly slow, trailing that of every contender except the Plustek unit. Still, the Plug-n-Scan performed well and is a good choice for its target audience.

The Paragon comes bundled with essentially the same driver and software as the Plug-n-Scan but with very different hardware; it's the hardware that accounts for its lesser image quality. The SCSI connector makes installation a little harder than the Plug-n-Scan's, because you have to remove your computer's case to install the supplied SCSI board (if you don't already have one). Otherwise, setup is as easy as can be. It's worth noting that with this scanner, we found that the 48-bit option did improve image quality.

Our jury rated the Paragon fourteenth for quality of printed output and twelfth for on-screen quality, putting it somewhat below average overall. Scans showed the same flaws as those from the Plug-n-Scan but to a greater degree, with even muddier colors and a more obvious flattening effect, both in print and on-screen, resulting from a loss of shading. The monochrome test photo lost more dynamic range when scanned on the Paragon, with whites dulled down to a still grayer shade. The Paragon's speed was also unremarkable.

Ultimately, if you don't need the legal-size capability or lightning-fast scans, there's little to recommend the Paragon.

The Plug-n-Scan, however, offers above-average quality, and is a bargain for the price.—MDS

Pacific Image ScanAce PIE-1236U

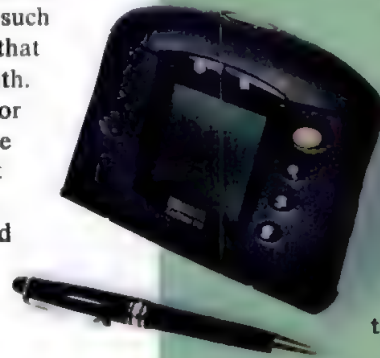
\$100 street. 600 x 1,200, letter-size, 36-bit, USB. Torrance, CA; 310-618-8100; www.scanace.com.

● Targeted at the home and SOHO markets, the Pacific Image ScanAce PIE-1236U achieves mixed results. Its software is solid, but the driver is harder to use than it should be. And although its image quality is easily sufficient for casual scanning, our jury didn't think it matched results from other scanners that cost less.

Setting up this scanner is easy, thanks to its USB connection and Plug and Play support. But although the ScanAce is easy to use for a quick scan, it has no help system, even though the driver includes some idiosyncratic controls and advanced options, such as Gamma adjustment, that most users will need help with. We also ran into a SCSI error that popped up when we were scanning at the highest quality. The company confirmed this as a bug and said that a fix will be available by the time you read this.

The bundled Newsoft Presto! Page Manager software includes a forms program and a specialized OCR program for business cards, as well as the usual image editor and the like.

Test scans in our labs showed muddy colors, both on-screen and in printed output. Monochrome scans showed a darkening effect more severe in printed output than on-screen. White objects turned gray on the printed version, which lost detail in dark areas. Scans also showed a slight loss in sharpness compared with the original and with other scanners' results. Even so, the ScanAce placed a respectable ninth in the roundup for printed output on our jury tests and fifteenth for on-screen results, putting its quality only slightly below the roundup's average. Scan speeds were well within the acceptable range. All told, this is a decent package, but not a good choice if your first priority is high-quality scans.—MDS



HP's wireless hand-held appliance

For mobile professionals, keeping up with the flow of paper documents can be an arduous task.

To help you store hard-copy documents in electronic form, Hewlett-Packard offers the HP CapShare 910 hand-held appliance (\$700 street). The CapShare works independent of a PC and runs on two rechargeable nickel hydride batteries, which come bundled with the unit. (Hewlett-Packard Co., 800-752-0900, www.capshare.hp.com.)

About the size of a Sony Walkman, this 12.5-ounce device lets you scan (in gray scale) various types of paper media—including magazines, business cards, and memos—and

store and share the information you've scanned. A typical, letter-size page will take approximately 6 seconds to scan. And documents as large as 119 square inches can be captured.

The CapShare is built around proprietary HP technology that determines the path the CIS has taken over a document and then reconstructs the image in the built-in 4MB memory. As you sweep the sensor over your document—from either top to bottom or side to side—the image is compressed through firmware and stored in memory as a digital data file.

You can then view the file on the built-in LCD and send it as a PDF or TIFF file via serial cable (included) or IR port to a printer, notebook or desktop PC, or hand-held device.

The interface makes it simple to navigate through stored images, send or delete scanned documents, and zoom in or out on the LCD. With a single battery charge, the CapShare will scan approximately 100 documents and store about 50 letter-size pages.

—Roderick A. Beltran

SUMMARY OF FEATURES

Desktop Scanners



	AcerScan Prisa 620U	Agfa SnapScan 1212U	Artec 1236USB	Canon CanoScan FB 620U	Canon CanoScan FB 1200S	Epson Perfection 636U	Epson Perfection 636	HP ScanJet 4200C	HP ScanJet 5200C
■ YES □ NO									
Products listed in review order									
Price	\$100 street	\$130 street	\$100 street	\$130 street	\$500 street	\$230 street	\$300 street	\$200 street	\$300 street
Sensor type	CCD	CCD	CIS	CIS (LIDE)	CCD	CCD	CCD	CCD	CCD
Rated maximum scan area (inches)	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7
Maximum color depth	36-bit	36-bit	36-bit	36-bit	36-bit	36-bit	36-bit	36-bit	36-bit
True optical resolution, in dpi	600 x 1,200	600 x 1,200	600 x 1,200	600 x 600	1,200 x 1,200	600 x 2,400	600 x 2,400	600 x 1,200	600 x 1,200
Interface connection as tested	USB	USB	USB	USB	SCSI	USB	SCSI	USB	USB
One-touch scanning	□	□	■	■	■	■	■	■	■
Image-editing software included	PhotoExpress 2.0	Corel Print House Magic	MGI PhotoSuite	Adobe PhotoDeluxe Home Edition	Adobe PhotoShop 5.0 LE	Adobe PhotoDeluxe Home Edition 3.0	Adobe PhotoDeluxe Business Edition 1.0	Adobe PhotoDeluxe 3.0	Adobe PhotoDeluxe Business Edition
OCR software included	Xerox TextBridge OCR	Caere OmniPage Limited Edition	Xerox TextBridge Classic	Xerox TextBridge Plus	Xerox TextBridge Plus	Included in Presto! Page Manager	Xerox TextBridge 3.0	Caere OCR included in driver	Caere OCR included in driver
Other software included	Kai's Photo Soap2	Caere PageKeeper, Color It!	None	None	CanoScan ToolBox	Broderbund PressWriter, Presto! Page Manager	Broderbund PressWriter, Presto! Page Manager	Caere PageKeeper Standard Edition	Caere PageKeeper Standard Edition
Twain driver included	■ (MiraScan)	■ (ScanWise 1.0)	■	■ (ScanGear)	■ (ScanGear)	■	■	■ (PrecisionScan)	■ (PrecisionScan)
Zoom/Batch scan/Rotate	■ ■ ■	■ ■ ■	■ ■ □	■ ■ ■	■ ■ ■	■ ■ □	■ ■ ■	■ ■ □	■ ■ □
Blur/sharpen/edge-enhancement filter	■ ■ ■	■ ■ ■	■ ■ □	□ □ □	□ □ □	■ ■ ■	■ ■ ■	□ □ □	□ □ □
Presets for particular printers	□	■	□	□	□	■	■	■	■
Parts-and-labor warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	90 days	90 days
Toll-free technical support	■	□	□	□	□	□	□	■ (90 days)	■ (90 days)
Technical support hours (eastern time)	24 hours, 7 days	8:00-8:00 M-F	11:30-8:30 M-F	8:00a-10:00p M-F, noon-6:00 Sat.	8:00a-10:00p M-F, noon-6:00 Sat.	9:00-9:00 M-F, 10:00-7:00 Sat., Sun.	9:00-9:00 M-F, 10:00-7:00 Sat., Sun.	8:00a-midnight M-F, 11:00-6:00 Sat.	8:00a-midnight M-F, 11:00-6:00 Sat.
Web site	www.acerperipherals.com	www.agfahome.com	www.artecusa.com	www.canoscan.com	www.canoscan.com	www.epson.com	www.epson.com	www.scanjet.hp.com	www.scanjet.hp.com

Plustek OpticPro 12000T

\$130 street. 600 x 1,200, letter-size, 36-bit, parallel port; Livermore, CA; 800-685-8088; www.plustekusa.com.

● A general-purpose flatbed scanner, the Plustek OpticPro 12000T has a built-in transparency adapter that doubles as a 35-mm film scanner for both slides and negatives. Despite its tortoiselike speed, the OpticPro's dual personality and ease of use represent value for families, small offices, and amateur photographers.

While it doesn't feature true one-touch capability, the OpticPro's Action Manager 32 interface puts users one mouse click away from launching a given application. Plustek's driver has an intuitive look, with easy-to-follow wizards that help you get the best scans. More advanced users will welcome its assortment of standard prescan tools.

The transparency adapter is simple to set up and use, especially because the

software automatically selects the appropriate size and resolution. The OpticPro is also among the quietest scanners we tested.

This device uses pixel-by-pixel, rather than line-by-line, scanning technology, which purportedly produces more accurate color alignment and sharper, more detailed scans. Indeed, our labs test images were noticeably sharp and clean, with relatively accurate colors. On the other hand, they were uniformly dark on-screen, with clipping in the highlights. Printed output exhibited almost normal exposure, however. Our jury ranked the OpticPro in the lower third for both print and Web output. In speed testing, though, it was the slowest of the pack.

Despite its average scanning quality, the OpticPro delivers convenience and versatility at a low cost. It's also the only scanner we tested with a built-in transparency adapter.—*DG and SWG*

UMAX Astra 2000P, 2100U

2000P: \$100 street. 600 x 1,200, letter-size, 36-bit, parallel-port. 2100U: \$170 street. 600 x 1,200, letter-size, 36-bit, USB. Fremont, CA; 800-562-0311; www.umax.com.

● UMAX offers two scanning options for entry-level consumers and businesses: the UMAX Astra 2000P and 2100U. They use the same CCD scanning engines and come with identical, highly integrated software.

The 2100U is a USB model with three one-touch buttons: one for scanning, one for copying, and one that can be customized to send a scan to e-mail or OCR. The 2000P is a parallel-port model with no external buttons that costs \$70 less. Neither one is particularly fast, and neither produces outstanding scans. But both are fine choices for anyone seeking ease of use and decent performance.

The parallel-port-based 2000P sets up quickly, aided by a gratifyingly complete

PC MAGAZINE
 EDITOR'S CHOICE

HP OfficeJet R40	Microtek SlimScan C6 USB	Microtek ScanMaker X6 USB	Mustek Plug-n-Scan 1200 ED	Mustek Paragon 1200 FS	Pacific Image ScanAce PIE-1236U	Plustek OpticPro 1200T	UMAX Astra 2000P	UMAX Astra 2100U	Visioneer OneTouch 5300	Visioneer OneTouch 7600
\$600 street	\$100 street	\$149 list	\$99 list	\$299 list	\$100 street	\$130 street	\$100 street	\$170 street	\$100 street	\$130 street
CCD	CIS	CCD	CCD	CCD	CCD	CCD	CCD	CCD	CCD	CCD
8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 14.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7	8.5 x 11.7
30-bit	36-bit	36-bit	30-bit	36-bit	36-bit	36-bit	36-bit	36-bit	36-bit	36-bit
600 x 2,400	600 x 1,200	600 x 1,200	600 x 1,200	600 x 1,200	600 x 1,200	600 x 1,200	600 x 1,200	600 x 1,200	300 x 600	600 x 1,200
Parallel	USB	USB	Parallel	SCSI	USB	Parallel	Parallel	USB	Parallel	Parallel
■	■	■	□	□	□	□	□	■	■	■
Adobe PhotoDeluxe Business Edition	Adobe PhotoDeluxe Ulead PhotoImpact	Adobe PhotoDeluxe Ulead PhotoImpact	iPhoto 1.2 Ulead Photo Express 2.0 SE	Ulead Photo Express 2.0 SE	Presto! ImageFolio LE	Adobe PhotoDeluxe Home Edition 2.0, MicroGrafx Picture Publisher	Adobe PhotoDeluxe 3.0	Adobe PhotoDeluxe 3.0	MGI PhotoSuite 2 SE	MGI PhotoSuite 2 SE
Caere OCR included in driver	Caere OmniPage LE	Caere OmniPage LE	Xerox TextBridge Pro 8.0	Xerox TextBridge Pro 8.0	Presto! WordLink	Xerox TextBridge	Caere OmniPage LE OCR	Caere OmniPage LE OCR	Visioneer OCR	Visioneer OCR
KMT Office In Color	Caere PageKeeper, p.x.com PictureFun!	Caere PageKeeper, p.x.com PictureFun!	Direct Scan utility (print to printer, e-mail, fax, file, OCR)	Direct Scan utility (print to printer, e-mail, fax, file, OCR)	Presto! Page Manager, Photo Album, Biz Card, Page Type, Page Filer	None	Presto! Page Manager, Photo Album LE, Biz Card, Page Type, ImageFolio LE, UMAX Copy Utility	Presto! Page Manager, Photo Album LE, Biz Card, Page Type, ImageFolio LE, UMAX Copy Utility	PictureWorks PhotoEnhancer, Visioneer PaperPort 6.1, Visioneer Web Publisher	PictureWorks PhotoEnhancer, Visioneer PaperPort 6.1, Visioneer Web Publisher
■ (PrecisionScan)	■ (ScanWizard)	■ (ScanWizard)	■	■	■	■ (Action-Manager)	■ (VistaScan)	■ (VistaScan)	■	■
■ ■ ■ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □
□ □ □ □	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ □	■ ■ ■ □	□ □ □ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □	■ ■ ■ □
□	□	□	□	□	□	□	■	■	□	□
1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
■	□	□	□	□	□	□	□	□	□	□
9:00–8:00 M–F	10:00–10:00 M–F, 1:00p–8:00p Sat., Sun.	10:00–8:00 M–F	11:00–8:00 M–F	11:00–8:00 M–F	11:30–8:30 M–F	10:00–9:00 M–F, 11:00–8:00 Sat., Sun.	9:00a–11:00p M–F, 11:00–8:00 Sat.	9:00a–11:00p M–F, 11:00–8:00 Sat.	11:00–8:00 M–F	11:00–8:00 M–F
www.hp.com/go/all-in-one	www.microtekusa.com	www.microtekusa.com	www.mustek.com	www.mustek.com	www.scanace.com	www.plustekusa.com	www.umax.com	www.umax.com	www.visioneer.com	www.visioneer.com

manual. The USB-based 2100U, by contrast, suffers from an irritating lapse in its documentation: The location of the required USB driver is unclear. Clarity would be especially welcome here, considering Windows 98's occasional reluctance to recognize USB devices. Otherwise, the 2100U is easy to configure using

the VistaScan Twain driver.

Both models produced the same image quality in our labs. Each received fair ratings overall from our jury, on both color and gray-scale photo images. Although we saw some loss of image sharpness in anecdotal scan testing using the default settings, the results overall were even and generally pleasing, with no obvious artifacts, banding, or posterization. In speed testing, we found both models relatively slow, as measured both in prescanning and in full-resolution testing.

The software bundled with both UMAX scanners includes a full version of Adobe PhotoDeluxe 3.0, Caere OmniPage Limited Edition, a UMAX copy utility, and a full suite of scanning software, including Newsoft Presto! PageManager for managing images, PhotoAlbum LE for creating and sharing photos, ImageFolio editing and special-effects software, and PageType for scanning and filling in forms.

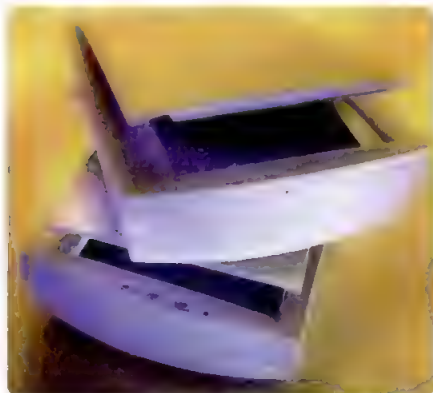
Reasonable performers stocked with excellent software, both UMAX models are good choices for users buying their first scanner. The added conveniences afforded by the 2100U's USB connection and one-touch buttons are worth the slight price premium, but if you don't have a USB port, you can get the same results from the 2000P.—BB

Visioneer OneTouch 5300, 7600

5300: \$100 street. 300 x 600, letter-size, 36-bit, parallel port.
7600: \$130 street. 600 x 1,200, letter-size, 36-bit, parallel port. Fremont, CA; 888-229-4172; www.visioneer.com.



The Visioneer OneTouch 5300 and 7600 both deliver respectable images and include five buttons for unusually easy and versatile scanning. Families will appreciate the bundled PaperPort software, which makes scanning almost as easy as photocopying. Aside from minor



The highly integrated software makes the UMAX scanners fine choices for beginners.

cosmetic differences, what distinguish the two units from each other are resolution and interface. The 7600 comes with the very latest version of PaperPort (6.1), though the 5300 ships with Version 5.3.1.

Scanning is a snap with these devices, once you set up everything properly. Initially customizing your autoscans can be confusing, though, because the default profiles—for type of original, resolution, file format, and destination—can't be changed. But the interface does allow you to create and save your own scans and color profiles. The one-touch buttons are clearly marked according to purpose (Scan, Copy/Print, Fax, Custom, and Stop), and all but the Stop button are user-programmable.

The 5300 and 7600 are among the few scanners in this roundup that can both scan and save in 36-bit color (though none of the bundled software supports 36-bit color). Visioneer offers both models with USB interfaces at the same prices.

Visioneer's PaperPort document management software is still a fine interface, despite its dearth of prescan tools. Users

can see all of their scanned images, regardless of type: text, photograph, or gray scale. Double-clicking on a thumbnail almost instantly brings up a zoomable image, and dragging it into an application's icon imme-



Visioneer scanners use one-touch technology and are incredibly easy to use.

diately launches the appropriate program and inserts the scan. It is interesting to note that while the 7600's PaperPort 6.1 performed flawlessly on our OCR test, Version 5.3.1—which ships with the 5300—

failed the test with more than 25 errors. Visioneer claims it will be updating the 5300's software to Version 6.1.

Our jury rated both scanners' image quality as equal—almost in a dead heat—though the 5300 slightly edged out its more expensive counterpart. Test scans for both units exhibited accurate color, though images from the 5300 were slightly underexposed. The tonal range of both scanners was also accurate, with no clipping in the highlights or shadows, though there was a lack of density in the midtone data. Details were clearly visible, but they lacked sharpness and snap. On the whole, we were impressed by how closely the scans (viewed on our monitors) matched the originals, despite their slight softness. Though the 5300 and 7600 aren't speed demons, their easy automation gives them relatively short scan-to-finish times.

In sum, the Visioneer OneTouch 5300 and 7600 are very affordable devices, useful for anyone intimidated by the whole idea of scanning. They'll also do the trick for many less demanding small business users.—DG and SWG **PC**



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Share a Net Connection



Windows' new Internet Connection Sharing can cut down on costs when you want to give Internet access to multiple users.

By Neil Randall

Let's say you have two computers in your house. The first is yours, the second is shared by your spouse and kids. Because you need an Internet connection for working from home during the evening (okay, and maybe a few other things), you have a spiffy new 56K V.90 modem hooked to an ISP through the second phone line.

Now your spouse and kids are clamoring because they want Internet access too, and you know this could present some problems. First, you don't want to install additional phone lines or share the ones you have. Second, paying your Internet service provider (ISP) an extra \$15 to \$20 per month and buying a new modem are not expenses you want right now.

Another situation: You're an employee in a small business, where three computers are shared among you and four other employees (the boss gets one to herself). So far, things have worked well with a small LAN in place, but your recent research has concluded that the company would be importantly served by an Internet connection.

You want to propose that the office get a connection, but you conclude that your boss's penny-wisdom will make her turn down a request for three separate Internet connections. Meanwhile, you're sure that putting an Internet connection on only one machine is not the answer at all.

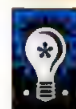
The solution to both scenarios is available in Microsoft Windows 98 Second Edition and in Windows 2000. In fact, it shipped as part of Internet Explorer 5, which is included with both OSs. It's called *Internet Connection Sharing* (ICS), and its purpose is to minimize Internet costs for locations needing Internet connections for more than one computer.

The principle is simple: If you have two or more computers in a local area network (LAN) in which they're already sharing resources, and you have a dial-up Internet connection through an ISP, why not let the machines on the LAN share the Internet connection as well as the other resources?

GET READY FOR ICS

To establish Windows ICS, you need a functioning LAN. If you'd like to learn how to set up a home network, see the article "Home Network Setup," in the previous issue's Tutor section. The computers that will share the Internet connection must be attached to this LAN, and they must all be able to see the computer that the modem is attached to in their Network Neighborhoods. This machine is

USER TO USER



Change the default installation drive for Office programs; get CDs to start automatically; fix Quick Launch Icons; reorder Start menu choices; plus Excel and Access tips. *Page 235.*

UTILITIES



Folder Pointers lets you add items to the Start menu that will expand to show the contents of any folder you choose, including the Desktop and My Computer folders. *Page 243.*

ENTERPRISE COMPUTING



Windows 2000's Active Directory provides a highly integrated, distributed data store for corporations that use Windows NT Server. It offers improvements in security, access control, and network management, and it uses a unified data-storage and access-control mechanism. *Page 245.*

PC TECH



Whenever you're logged in to the Internet, your computer is assigned an IP address. The Dynamic Host Configuration Protocol (DHCP) makes sharing IP addresses among several computers possible. We'll show you how the protocol lets LAN managers allocate and configure IP addresses. *Page 251.*

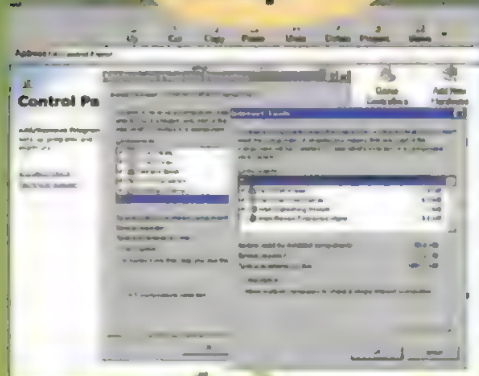
More on the Web:
You'll find all of the articles, examples, and code files in this section at PC Tech online.

www.pcmag.com/pctech



How to Set Up Internet Connection Sharing

Step 1



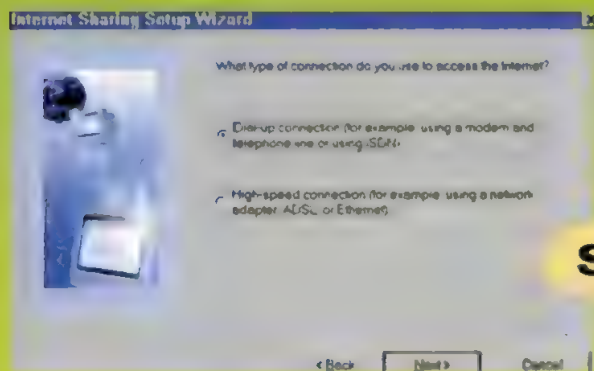
INSTALL THE INTERNET CONNECTION WIZARD

One of the computers on the LAN must be designated as the sharing computer. On this computer (and only on this computer) you must now install the Internet Connection Sharing tool (ICS), which ships with Microsoft Internet Explorer 5 and Windows 98 Second Edition. To find out if it's available to you, go to Control Panel, open the Add/Remove Programs component, click on the *Windows Setup* tab, and then click the *Internet Tools* item and the *Details* button. ICS should appear at the top of the *Components* list. To install it, put a check in its box and click *OK*, and then *OK* again. Reboot when the installation is complete.

Step 2

RUNNING THE ICSW

You are now ready to set up ICS through the Internet Connection Sharing Wizard (ICSW). To run the wizard, open the *Internet Options* dialog from IE5's *Tools* menu (or by opening the Internet Options applet in Control Panel). Click the *Connections* tab, and then the *Sharing* button in the LAN section of the dialog box. Check the option labeled *Enable Internet Connection Sharing*. When you click *OK*, the ICSW will start.



SPECIFY THE CONNECTION TYPE

In the next step, the ICSW asks you to specify the type of connection you wish to share: dial-up or high-speed. Examples are given with each choice. Note that the dial-up option includes ISDN, which indeed requires dialing in to the ISP, but not ADSL, although that requires dialing in too. If you have a cable modem, choose high-speed. Configuring a cable modem, as with any high-speed connection, may be complex. For this article, we look at dial-up connections only, first because they're by far the most common means of hooking up to the Internet, and second because they're relatively standard.

Step 3

called the *Connection Sharing Computer* (shortened to *sharing computer* here). The principle behind the Internet Connection Sharing software is that the sharing computer connects to the Internet via a dial-up networking connection through the modem (or via a high-speed networking connection), and the other computers use the LAN to share the modem. All of the machines on the LAN can use the connection for their own work as long as the sharing machine is

connected to the Internet; in fact, they can even do so simultaneously.

HOW IT WORKS

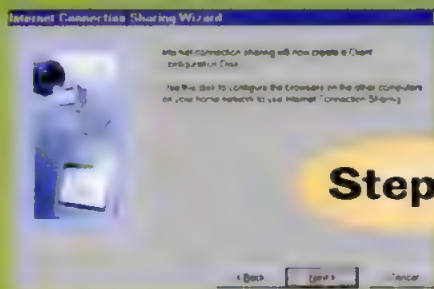
Internet Connection Sharing works by fooling the Internet into thinking that only one computer is performing Internet requests, uploads, and downloads. The sharing machine acts as a focal point for the entire LAN, with all incoming and outgoing data passing through it. In effect, the sharing computer

acts as a proxy server, and in fact, Windows ICS is a kind of simplified proxy server. Full proxy servers control, secure, and cache all incoming and outgoing data, and they offer control over individual machines on the LAN, whereas Windows ICS just routes data and offers minimal security.

With Windows ICS, each computer on the LAN is given its own unique IP (Internet Protocol) address, just like all other computers on the Internet. The LAN's IP addresses are

SPECIFY THE SETTINGS

Once you've chosen the dial-up connection type, you must specify which settings to use. If you have only one ISP, you'll have only one choice. If you have multiple ISPs, you'll see a menu of choices similar to the one shown here. Click the one you want to use, and then decide whether you want to dial in automatically whenever you access the Internet. If you have only one phone line, keep this option off to avoid annoying those who might be using the phone.



Step 5

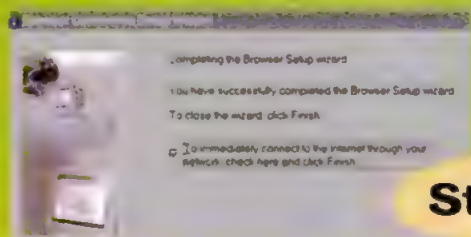
SET UP THE CLIENTS

The next stage of the wizard involves creating a Client Configuration disk. This disk lets you configure the remaining machines on the LAN to use ICS. You'll need a formatted disk for this step. If you haven't already set the machines to connect through the LAN, put the Client Configuration disk in each client's floppy disk drive and run `A:\ncsclset.exe`. This will run the Browser Connection Setup wizard, which sets the client's Internet connection to run through the LAN. Click *Finish* in the final dialog of the ICSW. Before sharing can occur, each client PC must have TCP/IP installed; use the Network applet in each machine's Control Panel to install the protocol.

THE IP ADDRESS

The wizard changes the sharing machine's IP address to 192.168.0.1, which allows ICS but might also adversely affect your sharing machine's ability to communicate with some LAN-based Internet connections. We're assuming dial-up connections here, so we won't concern ourselves with this issue.

The IP number for the client computer—configurable through the *TCP/IP Properties* dialog in the Network applet—should be left blank, so that the sharing computer can assign the IP numbers dynamically. If you wish, however, you can manually set the IP numbers of each client: The possible numbers range from 192.168.0.2 through 192.168.0.253, and you need not assign them in any order within that range.



Step 7

START SHARING

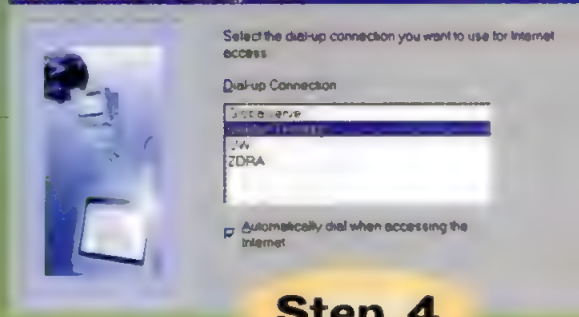
After performing all the necessary rebooting, it's time to watch ICS work some magic. Using the sharing computer, connect to the Internet through its dial-up connection. Make sure the connection works by trying a few uncached Web sites, and then move to a client machine. Open a browser and head for some sites, send some e-mail, do some file transfers, and so on. You won't notice anything special in how the various applications work, except that they do in fact work.

private to that LAN, however, and these addresses do not provide direct Internet access. The only computer with a public IP address is the sharing machine, which has both a private and a public IP. The public IP number is assigned by the ISP at the time of connection, while the private IP number is assigned through the Network applet in the Control Panel, either manually or via the Internet Connection Sharing wizard.

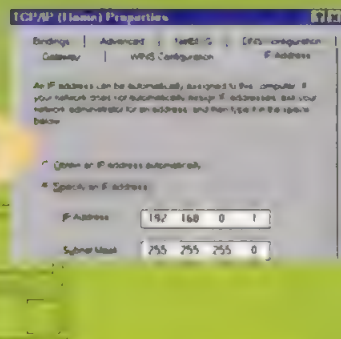
The private IP address for the sharing

computer is 192.168.0.1; the 192.168 series is restricted to private LAN use (that is, the Internet doesn't recognize 192.168 numbers). The ICS wizard sets this address automatically, but you can also set it yourself using Control Panel's Network app. The remaining computers on the LAN require IP numbers in the range 192.168.0.2 through 192.168.0.253. You can assign these numbers through the Network app, or you can have the sharing computer assign them through the built-in

Internet Connection Sharing Wizard



Step 4



Step 6

DHCP (Dynamic Host Configuration Protocol) routine. The latter is easier, simply because it eliminates the need to dig into each machine's Network app manually. For more on DHCP, see the article "Dynamic IP Addressing in Windows" in this issue.

When a computer on the LAN sends a request to the Internet, such as to send e-mail or connect to a link on a Web page, that computer's private IP address is sent to the sharing computer. There, the private address is

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translated to the sharing machine's public address—with the original IP address retained in conjunction with the request by the sharing computer—so that the requested Internet server can respond. The response from the Internet comes back to the sharing computer's public IP address, and the sharing machine recalls the original IP address and sends the response to the appropriate computer on the local area network.

The sharing computer works the same way as all other LAN machines, translating all interactions from the 192.168.0.1 address to the public IP address. But because the data need not flow between machines in this case, the process is faster than one in which the data traverses the LAN's wires. But the sharing machine *will* be affected by network slowdowns just like any other computer on the LAN.

With a small LAN, the most noticeable slowdowns will occur when two computers are accessing the Internet simultaneously. In informal testing, using just a stopwatch, we found that simultaneous activity from two machines dropped speeds to as little as half the single-connection speed (but mostly not that drastically). If internal LAN activity is also going on, speeds drop a bit more. You will never get a shared connection to reach the modem's full speed, but then again you can almost never do that with a single-connection modem anyway. Of course many other network factors affect speed, including such uncontrollable aspects as ISP congestion and slow remote servers. If a shared connection slows down, it's not necessarily because of the sharing.

There's nothing new about Internet Connection Sharing. In fact, you've been sharing your ISP connection (including that T1 line your company has) with other users ever since you've been on the Net. Sharing isn't even new with Windows PCs, as third-party solutions are already available. But Windows' ICS feature now brings sharing to anyone with a Windows 98 Second Edition or Windows 2000 machine with a modem and at least one other computer on the network. In other words, it's now part of the mainstream, it's easy to implement, and it works. **PC**

Neil Randall is a contributing editor of PC Magazine. He is the coauthor of the Que's book Special Edition Using Microsoft FrontPage 2000.

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USER TO USER

Changing Office's Installation Drive

I have Microsoft Word 7 and need to run the installation program to add some components I didn't install originally. Unfortunately, I've added a second hard disk since installing Word, which changed the assignment for my CD-ROM drive from D: to E:. When I try to run the installation program from the Add/Remove Programs applet in Control Panel, Windows looks for the CD-ROM in drive D: without offering a *Browse* button to let me tell it the proper location. Is there anything I can change so that Windows will look to my E: drive instead, letting me run the installation program?

Ian Jameson
via the Internet

PC You don't mention whether you installed Word 7 from a Word disk or from an Office 95 disk. If you also have Excel installed, however, there's an easy way to make Windows look to the right drive, which will work in most if not all cases.

When you install any Office program, setup information is stored in an STF file. The full filename depends on what you installed. If you installed Word from an Office 95 Standard CD, for example, the file will be *Off95std.stf*. Other possibilities are *Off95pro.stf* if you installed from an Office 95 Professional disk and *Wrd95.stf* if you installed from a Word 95 disk. One of the pieces of information the STF file stores is the drive from which you installed the program. Change this entry in the file and Windows will look to the proper drive. The bad news is that you can't edit this file in Word, which will mangle the file's format when you save it. The good news is that you can edit it in Excel.

First find the file by choosing *Start | Find | Files or Folders* and searching for *.stf. If you have many programs installed on your system, you'll likely find a number of STF files.

The one you're looking for should be reasonably obvious from the name. It's also likely to be in your Office directory structure in a folder called *Setup*.

Start by renaming the file, changing its extension to .old. Then make a copy with the same name as the original file, complete with the .stf extension. You'll be making all changes to the copy and will still have the original untouched should something go wrong and you need to recover it.

Open Excel, then open the copy of the file.

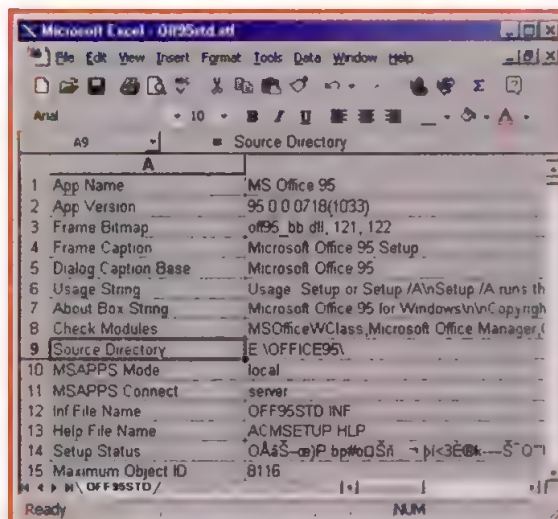


FIGURE 1: Microsoft Excel can open the file containing installation information for Office applications.

Excel will start the Text Import Wizard. Choose *Next* in the Wizard's first two dialog boxes. In the third dialog box—*Step 3 of 3*—scroll down in the *Data Preview* box until you see the word *ObjID* in the first column. (If you don't scroll down to this column, Excel's Import Wizard will detect the wrong number of columns, which will make the file impossible to use.)

You'll need to format each column as text. You can do this one column at a time, but an easier way is to select all the columns and define them all at the same time. Use the scroll

bar to move to the extreme right side of the data. Then hold the Shift key down and click on the rightmost column to select all of the columns. In the area labeled *Column data format*, choose *Text*. Then choose *Finish*. Excel will finish the import and insert the data in a worksheet.

Next look for the words *Source Directory* in column A. (You shouldn't have to go far for this. In my STF file it wound up on line 9 in the spreadsheet, as shown in Figure 1.) Column B should show the incorrect location—for example, D:\ if you originally installed from the D: drive. Change the letter to match the current letter assigned to your CD-ROM drive.

Next you'll need to set up the worksheet so that Excel will save it in the proper format. Select all the text in the worksheet by hitting Ctrl-Shift-Spacebar. Then choose *Format |*

Column | AutoFit Selection to widen each column so that all of the text will fit. Choose *File | Save As...*, make sure you're saving to the same directory you loaded the file from, and make sure the *Save as type:* box reads *Text (Tab Delimited)*. Check that the name matches the name of the file you started with, and choose *Save*. Close the file without any further saves. If you now choose *Start | Settings | Control Panel*, open *Add/Remove Programs*, select the appropriate entry for your copy of Word, and press the *Add/Remove* button, Windows should look in the proper drive for the CD.—M. David Stone

Auto-Starting CDs

We plan to distribute information in HTML format on CDs. Our users are not very knowledgeable about PC operation, so we'd like to have the CDs auto-start if possible. Is there a way to do this?

Bob McIvor
via the Internet

PC In order to start automatically, a CD-ROM needs an *Autorun.inf* file in its root directory. This file defines what program is launched when the CD-ROM starts and the icon that represents it in Windows Explorer. A typical *Autorun.inf* file looks like this:

```
[autorun]
open = setup.exe
icon = myicon.ico
```

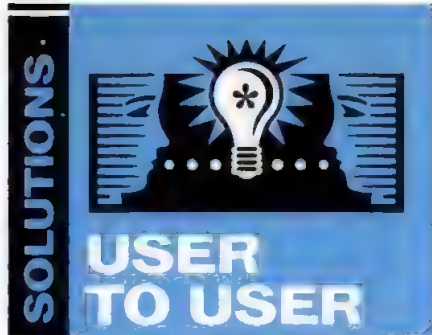
A typical startup program launched from

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Autorun.inf is small and quick to load, so that users will know right away that the CD is starting automatically. Generally such programs display a dialog box that asks for permission to install the application. The main install program loads in the background while the user reads the dialog box, so it's ready to execute when the user presses *OK*. In practice, though, your startup program can do whatever you wish, including launching a browser to display your opening page of HTML.

Testing an auto-run application would be tedious if you had to burn a new CD-ROM for each revision. You can avoid this difficulty by temporarily enabling auto-run for floppy disks. To do this, save the following three lines as Autoflop.reg:

```
REGEDIT4
[HKEY_CURRENT_USER\Software\Microsoft\
Windows\CurrentVersion\Policies\
Explorer]
"NoDriveTypeAutoRun"=hex:91,00,00,00
```

Keep in mind that the middle block (enclosed in square brackets) should be entered as one line. Next, copy Autoflop.reg to Notoflop.reg, and then edit Notoflop.reg so that the "91" in the last line is replaced by "95." Double-click Autoflop.reg to merge its contents with the Registry, then restart Windows. Auto-run for floppy disks is now enabled. Note, though, that Windows won't automatically launch Autorun.inf when you insert a floppy disk. You must right-click the disk's icon in Explorer and choose *Autoplay* from the pop-up menu.

Copy your Autorun.inf file, icon, and startup program to a floppy disk, along with any other program files that will fit. You may need to modify the programs slightly, having them look for data on the CD-ROM instead of the floppy disk. When you're done debugging your auto-run application, double-click Notoflop.reg. This will return your system to the normal state, where auto-run is not enabled for floppy disks.—Neil J. Rubenking

Reorder Your Start Menu

It's great to be able to change the order of items in the Start menu, but doing so can eventually result in a very disorganized list. Because Windows stores the order information in the Registry, I decided to write a Registry entry to correct the problem. Save the lines below as Menuodr.reg.

```
REGEDIT4
[HKEY_CURRENT_USER\Software\Microsoft\
Windows\CurrentVersion\Explorer\
```

```
MenuOrder\Start Menu\&Programs\Menu]
"Order"=hex:00,00,00,00
```

The Order value in the Registry controls the sequence of the folders. Setting it to zero forces Windows to use alphabetic order. Launch this file, restart Windows, and your Start menu will be restored!

Dennis Ng
Boston

PC The ability to set the order of your Start menu items by dragging them is a feature of the Windows Desktop Update, installed with Windows 98 and optionally with Internet Explorer 4 and 5. If your system isn't running the Windows Desktop Update, your Programs menu is always in alphabetic order, and you don't need this tip.

When you create Menuodr.reg, keep in mind that the file has just three lines. The middle section of code is enclosed in square brackets; make sure you put it on one line when you create Menuodr.reg. Double-click Menuodr.reg to merge its contents with the Registry.

Note that this fix restores order only to the Programs menu itself, not to any of its submenus. If you want to zap the Programs menu and all of its submenus back into alphabetic order, you can use the PC Magazine utility MenuZap (available at www.pcmag.com/downloads). MenuZap carefully searches the section of the Registry that defines menu

order. When it locates a value that specifies the order for a particular submenu of the Programs menu, it records and then clears the value's data. This leaves the Registry structure in place, but with each submenu restored to alphabetic order. The saved order data also lets MenuZap undo its most recent operation.

Taking the opposite approach from MenuZap's surgical precision and reversibility, you can blast the Programs menu and all of its submenus back into alphabetic order by deleting the appropriate key from the Registry. The setup information file Menuodr.inf, shown in Figure 2, handles that task. It also restores order to the Start menu's Favorites submenu, the Favorites menu in Internet Explorer, and the Favorites bar that appears when you click IE's Favorites icon. To delete these three Registry keys, right-click Menuodr.inf and choose *Install* from the pop-up menu. Restart your computer and alphabetic order will prevail, at least for now. This deletion isn't permanent; the menu order Registry keys will be re-created by the system as needed. If your menus start to get disorderly, just run Menuodr.inf again.—Neil J. Rubenking

Restoring Quick Launch Icons

The Quick Launch section of my Windows 98 taskbar had a serious problem with changing icons. Though the underlying shortcuts were correct, the icons were being replaced with those of other objects.

The following solution seems to have solved the problem. In the Registry key HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Explorer, find or create the

```
[version]
signature="$CHICAGO$"

[DefaultInstall]
DelReg=EraseThis

[EraseThis]
; Programs submenu of the Start menu
HKCU,"Software\Microsoft\Windows\CurrentVersion\Explorer\MenuOrder\
Start Menu\&Programs"

; Favorites submenu of the Start menu
HKCU,"Software\Microsoft\Windows\CurrentVersion\Explorer\MenuOrder\
Start Menu\Favorites"

; Favorites menu and Favorites bar in Internet Explorer 4
HKCU,"Software\Microsoft\Windows\CurrentVersion\Explorer\MenuOrder\Favorites"
```

! WARNING This file deletes three Registry keys that hold information about menu order, forcing the Programs and Favorites menus back to alphabetic order.

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string value `Max Cached Icons` and set its value to 2048 (or more). This will reduce disk thrashing as well.

Jerome J. Slote
via the Internet

PC The Quick Launch toolbar feature is part of the Windows Desktop Update, built into Windows 98 and optionally installed along with Internet Explorer 4 or 5. It lets you launch your most-used programs from simple icons on the taskbar, without requiring you to wade through levels of menus or locate icons on the desktop.

Windows caches the icons for Quick Launch toolbar buttons, *Start* menu items, and other often-used icons in a file called `Shell-IconCache`. By default, this file holds 512 icons. When the number of icons used by the system exceeds this number, Windows has to read more icons directly from the files that contain them. The result is unnecessary disk access (thrashing), which is especially noticeable if you have a slow or noisy hard disk. Exceeding the cache's capacity should not cause the scrambled-icons problem described above, but many readers have reported that it does.

To increase the size of the icon cache, you don't have to load the powerful *Regedit* program. Instead, save the following three lines as `Maxcache.reg`:

```
REGEDIT4
[HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\
Windows\CurrentVersion\explorer]
"Max Cached Icons"=dword:00001000
```

Keep in mind that the middle block of code is enclosed in square brackets and should be entered on one line. When you double-click `Maxcache.reg`, the `Max Cached Icons` value will be set to 4096—the decimal equivalent of the hexadecimal number `00001000` on the last line.

If you want to use a value other than 4096, you'll have to translate it into a hexadecimal. Fortunately, Windows' calculator will do that job for you. Just enter the number you want, then click the option button labeled *Hex* to convert it to hexadecimal. If you don't see an option button labeled *Hex*, choose *Scientific* from the *View* menu. Now copy the resulting hexadecimal number into `Maxcache.reg`, replacing `00001000`, and double-click `Maxcache.reg`.—Neil J. Rubenking

Get the Header from An Excel Cell

How can I reference a cell in Excel 97 in the footer or header? For example, if cell A1 contains 98-



34021, I want this data to show up in the header or footer. I'd want any changes to cell A1 to appear there too.

Gale Powell
via the Internet

PC The following two-line procedure assigns the value of A1 to the left header of the current sheet.

```
Sub UpdateLeftHeader ()
  lhtext = Range("a1").Value
  ActiveSheet.PageSetup
    .LeftHeader = lhtext
End Sub
```

You can use a procedure similar to this one to assign any cell's value to any component of your header or footer. The properties for the other components are just what you would expect: `CenterHeader`, `RightHeader`, `LeftFooter`, `CenterFooter`, and `RightFooter`.

To update the header automatically when A1 changes, you need to create an event procedure, as well as the procedure just listed. Here are the steps:

- Press Alt-F11 to bring up the Microsoft Visual Basic editor.
- In the Project Explorer (usually the upper-left window, but you can press Ctrl-R to display it), look for an entry named *Microsoft Excel Objects*. If there's a plus sign to the left of this entry, click it to expand the entry.
- Double-click the sheet name for the sheet whose header or footer you want to update automatically.
- Above the code window, you'll see two drop-down lists with the entries (*General*) and (*Declarations*). In the left list, select *Worksheet*. In the right list, select *Change*. The following code skeleton should appear:

```
Private Sub Worksheet_Change(ByVal
Target As Excel.Range)

End Sub
```

Between these lines, type

```
If Target = Range("a1") Then
UpdateLeftHeader
```

Just ignore the second code skeleton, containing the `Worksheet_SelectionChange` func-

tion. That's the default event for the *Worksheet* object. You don't want to use this one, because doing so would cause the macro to run any time the user changed the selection on that worksheet, so it would run many times unnecessarily.—Craig Stinson

Dealing with Saved Printer Settings

I've established a database for use by the people in my office and placed the file on a server in our data processing division. When others access the information in my file and print out reports, however, the reports print on my printer instead of my coworkers' default printers. It's almost as though default printer specifications are kept with the report even when other users access it.

Do you know why? I've checked with the programming department in our data processing division but haven't received an answer.

Judy Hite
via the Internet

PC Actually, both forms and reports have a property called `prtDevNames` that is populated when you select a specific printer (as opposed to the default printer) using the *Page Setup* dialog and save your changes. So it sounds like your personal printer specifications have indeed been stored with the report. Later, when someone prints the report, Access tries to send it to the specified device based on what's saved in the `prtDevNames` property.

The easiest way to correct this is to retrieve the database, open the report in design mode, select the *File* menu, choose *Page Setup*, choose the *Page* tab, and select *Default Printer*. Then click *OK* and save your changes when you close the report.

If you're interested in learning to which printer each of your reports is currently set to print, you can download the *WhatPrinter97.mdb* database file from www.pcmag.com. Click on *Downloads* and get the issue archive for this issue. This database contains the `zsrPrtDevNames` module and the *Display Printers for Reports* macro. Import these into your database (select the *File* menu and choose *Get External Data*) and run the macro. The macro runs some custom code that will open every report in design mode and display the name of the report, the name of the selected printer, and whether you've chosen *Default Printer* in the *Page Setup* dialog. You'll find this useful for discovering those instances where you've selected a specific printer for a report.—Sal Ricciardi **PC**

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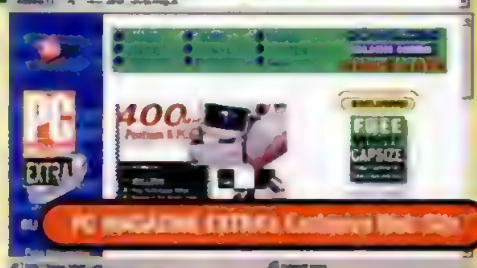
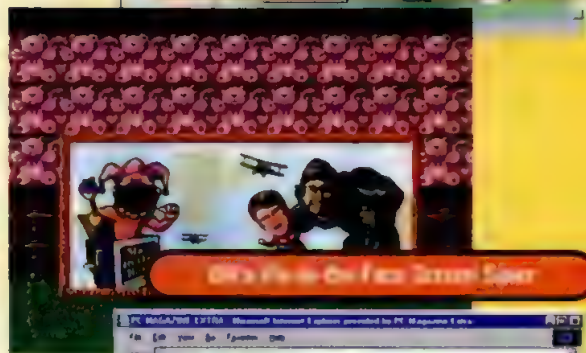
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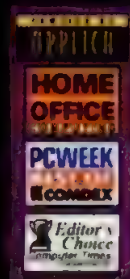
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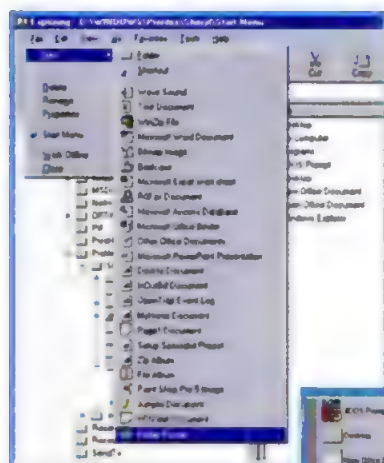
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Open Folders from Your *Start* Menu

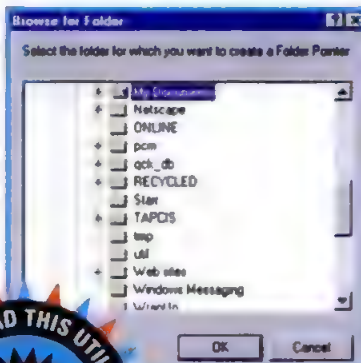
You can include file folders on the *Start* menu, but to view their contents you have to click on them to open an Explorer window. This is inconvenient if you're working with another application. Also, some folders, such as My Computer, cannot be placed on the *Start* menu at all. With **Folder Pointers**, you can place *any* folder you choose on the *Start* menu, and you can view its contents as a submenu, all without having to open an Explorer window.

Folder Pointers runs under Windows 95, Windows 98, and Windows NT 4, and it requires the desktop update. An article about how to use Folder Pointers and how it was written is available on our Web site at www.pcmag.com/utilities. A link to download the utility and its Delphi source code can also be found there.

Ignacio Alvarez is a software developer based in Nogales, Sonora, Mexico. Sheryl Canter is the editor of the Utilities column and a contributing editor of PC Magazine.



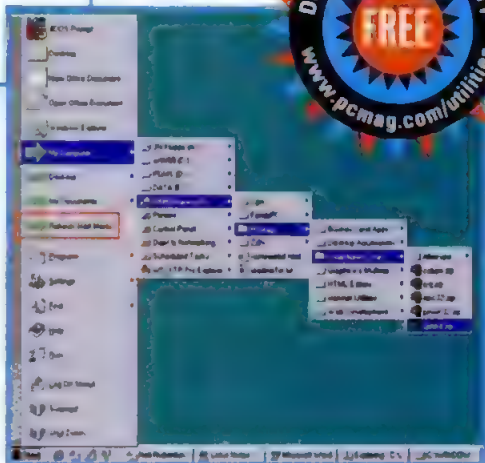
To add a Folder Pointer to your Start menu, right-click on the Start menu and choose Explore. Then select File | New | Folder Pointer. This will invoke a Browse for Folder dialog.



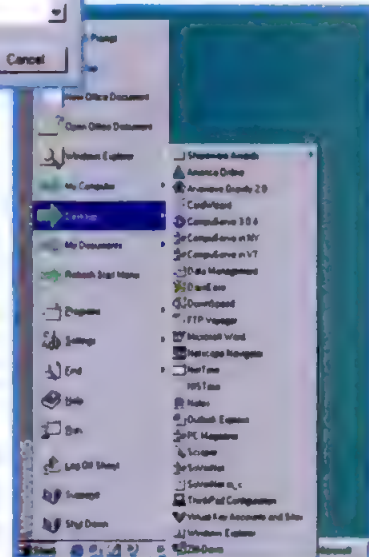
Select the folder you want to add to your Start menu using the Browse for Folder dialog. When you click OK, the folder pointer will be added immediately.



Because Windows caches the Start menu, you may need to click the Refresh Start Menu shortcut to see recent changes to your hard disk.



Folder Pointers lets you access any folder from your Start menu, including My Computer and the Desktop folder.



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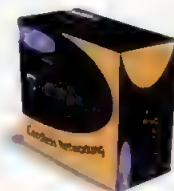
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The Directory-Enabled Enterprise

By Eric Greenberg

For corporations using Microsoft Windows NT Server, Windows 2000 Active Directory is perhaps the most significant addition to the Windows operating system to date. By providing a highly integrated distributed data store, Active Directory greatly eases security, access control, and network management. Users, groups, application components, and network resources are managed via a common, distributed, data-storage and access-control mechanism, providing significantly greater flexibility, scalability, and open-standards support than did Windows NT 4.

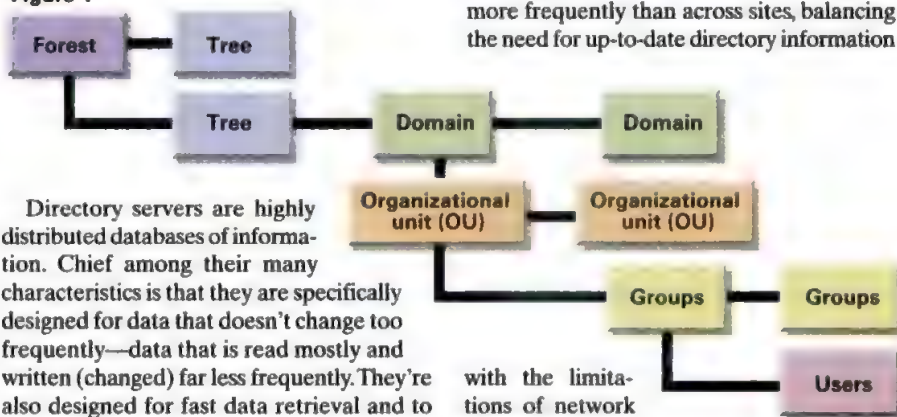
Prior to Active Directory, Windows NT 4 Server administrators were burdened with a user account management facility that didn't scale well. Windows NT 4 doesn't let users, groups, or network resources be managed in a hierarchical fashion. Analogous to trying to organize complex data relationships using a word processor instead of a relational database, Windows NT 4 directory services make management of complex accounts and resources very difficult for medium to large organizations. Furthermore, these services aren't integrated with other core administrative functions, such as the Domain Name Service (DNS). Windows NT 4 provides an unsophisticated method for replicating and synchronizing directory services information, requiring that changes be made only to predesignated servers called *Primary Domain Controllers*, inconveniently requiring them to be fully reachable and operational in order for important system changes to be made.

With regard to integration capabilities, the Windows NT 4 directory service is a rather closed system, offering a very limited set of application programming interfaces (APIs) and no standard directory service protocol for querying, publishing, or modifying directory entries. And finally, the Windows NT 4 authentication and authorization mechanism, known as NTLM, is proprietary.

By contrast, Active Directory excels in all of these areas by providing an advanced peer-to-peer data synchronization capability that

lets you make changes at any directory server—not just the master—by integrating with such fundamental networking and application services as DNS and Microsoft Certificate Server, by providing support for a range of open services including the Lightweight Directory Access Protocol (LDAP), and by offering support for a more open, scalable authentication and authorization mechanism called Kerberos. For programmatic access and extensibility, Active Directory Services Interface (ADSI) provides a COM-based proprietary API for querying, modifying, and publishing Active Directory information.

Figure 1



Directory servers are highly distributed databases of information. Chief among their many characteristics is that they are specifically designed for data that doesn't change too frequently—data that is read mostly and written (changed) far less frequently. They're also designed for fast data retrieval and to provide standardized data-access interfaces. Directory servers are typically distributed across a network so that they are easily reachable by clients and servers. Let's take a look at the fundamentals.

Data relationships and naming. General-purpose directories contain complex relationships among information elements. As does Windows NT 4, Active Directory makes use of users, groups, resources, and domains to locate resources within the network, control access to resources, and store user, group, and resource properties. In addition to these, Active Directory offers the following new methods of organization: organizational units (OUs), trees, and forests, as shown in Figure 1.

You can place users, groups, and resources into OUs. OUs are, generally speaking, object containers. Further, they are an administrative

tool, enabling you to assign rights and other attributes to an entire set of objects rather than to the objects individually. OUs can contain other OUs and can be arranged in a hierarchy through which trust can be inherited. In other words, trust is transitive between OUs.

Replication. Active Directory's new architecture does away with the Windows NT 4 master/slave replication model and replaces it with a far more sophisticated peer-to-peer model, whereby there is no longer a backup or primary domain controller but only domain controllers (DCs), all peers, all with the same capabilities. DCs are still assigned to domains, and they are said to be authoritative for those domains. You can use any DC to add, delete, or modify directory entries for the domain, as well as to propagate changes to other DCs. If a DC is down, you can use another DC within the domain. Active Directory information is replicated both within and among sites. Administrators can organize DCs from one or more subnets into sites, placing DCs that are well connected (such as those linked by high speed LANs) within one site, and placing DCs connected by low-speed links into separate sites. Active Directory replicates information within a site more frequently than across sites, balancing the need for up-to-date directory information

with the limitations of network resources.

Caching. To improve response time for directory queries, directory servers can save a copy of frequently requested directory service information locally, rather than constantly fetching this information from the source directory server, which may be located remotely across the network. Active Directory's cache is known as the Global Catalog (GC). The GC improves performance and efficiency by acting as a repository for commonly accessed information searched for within the Active Directory infrastructure. Any DC can be configured as a GC as well.

Directory server organization: domains and trees. Active Directory utilizes domains in a manner similar to Windows NT 4's directory service but offers considerably more flexibility in the organization of these domains. A

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given domain can itself be organized into organizational units. A domain can contain users, groups, resources, and OUs.

Whereas Windows NT 4 trust relationships are not transitive, with Active Directory they can be. You organize domains in a tree structure, and trust flows through the tree. A tree is a hierarchical structure of domains. Further, there's the concept of a forest, which is a collection of trees. None of this will make much sense to you unless we discuss naming within Active Directory. So let's proceed, armed with the knowledge that we can expect to find domains within the trees of the forest.

First, a domain is given a DNS-style name. For example, the Speedy Corp. might have the domain name *speedy.com*. If we wanted to create a tree to hold other domains under *speedy.com*, we would merely make sure they appear underneath the *speedy.com* namespace. For example,

speedy.com
division.speedy.com
group.division.speedy.com

Speedy.com is the root domain. The root domain's name is also said to be the name of the entire tree. So the name of our tree is *speedy.com*. *Division.speedy.com* can inherit trust relationships from *speedy.com*, and *group.division.speedy.com* can inherit them from *division.speedy.com*. You can't do this with Windows NT 4 directory services, but you can with Active Directory.

Username within Active Directory also follow the DNS naming style. For example, John Fastenberg, a Speedy employee in the domain *division.speedy.com*, might have the username *johnf@division.speedy.com*.

Note how our domain names are contiguous. That is, to build *division.speedy.com* and *group.division.speedy.com*, we just kept adding prefixes onto the root domain and maintained those prefixes as we grew the tree.

There are three points worth noting: (1) a user can be a member of only one tree, (2) if a user changes trees his username changes to reflect his new tree, and (3) all domains in a given tree trust each other via transitive hierarchical Kerberos trust relationships.

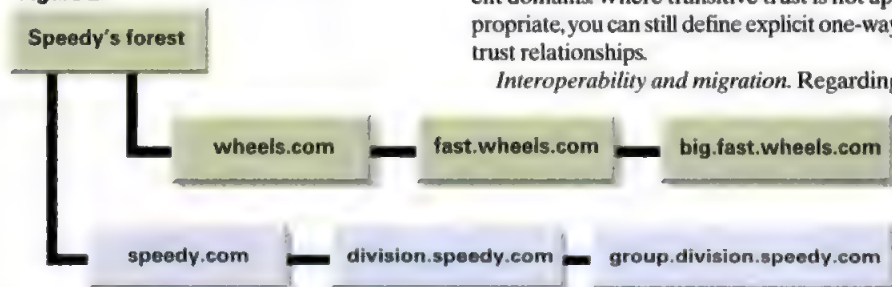
An important defining characteristic of a tree is that its namespace is contiguous, but that's not always practical within a large network, as when two companies with existing separate namespaces merge. Sometimes we want to have separate but somehow inter-related trees. That's what forests are for. Formally, a forest is defined as a set of one or more trees that do not form a contiguous namespace. Figure 2 shows an example.

Unlike trees, a forest does not need a distinct name. A forest exists as a set of cross-referenced objects and Kerberos trust relationships known to the member trees.

The directory infrastructure should be designed to minimize the movement of objects from one tree to another. Also, changing the structure of trees should be avoided due to the effect on the naming scheme.

Authentication, authorization, and trust management. Within the Windows 2000 environment, users log on to their Active Directory domain controller in order to access network resources. A user need authenticate himself to the domain controller only once in order to gain access to assigned resources. Active Di-

Figure 2



rectory implements this authentication and single user log-on facility through a security protocol and architecture called *Kerberos*.

Single user log-on with Kerberos is achieved through a ticket-granting mechanism. After a client successfully authenticates himself to an Active Directory domain controller, he is granted a Kerberos ticket. This ticket includes the client's Active Directory username, which gives network resources (such as file servers) the information needed to determine whether the client should, for example, be granted access to a particular file. All domains in the Active Directory tree trust this ticket. Note that tickets have finite lifetimes and are carefully created and verified in order to prevent hackers from simply creating their own false identity tickets or replaying someone else's ticket that they have stolen.

The Active Directory domain is equivalent to the Kerberos realm. The Kerberos Key Distribution Center (KDC) is integrated directly with the Active Directory Domain Controller's security services. Users can authenticate themselves to domains anywhere in the tree, because authentication services

(KDCs) in each domain trust tickets issued by other KDCs in the tree.

The default Windows 2000 domain log-on uses the Kerberos security provider to obtain an initial Kerberos ticket. Windows 2000 uses the Authorization Data in Kerberos tickets to carry Windows 2000 Security IDs representing user and group membership.

Trust management. Active Directory provides a means for interoperating with existing Windows NT 4 networks while allowing for migration to a significantly more capable Active Directory trust management facility. As previously mentioned, a transitive trust relationship exists among the domains in an Active Directory tree. This eliminates the need to maintain and manage cumbersome two-way trust relationships explicitly between all domains on a corporate network—something Windows NT 4 demands.

Domains that are members of the same tree automatically participate in a transitive, bidirectional trust relationship with their parent domains. Where transitive trust is not appropriate, you can still define explicit one-way trust relationships.

Interoperability and migration. Regarding

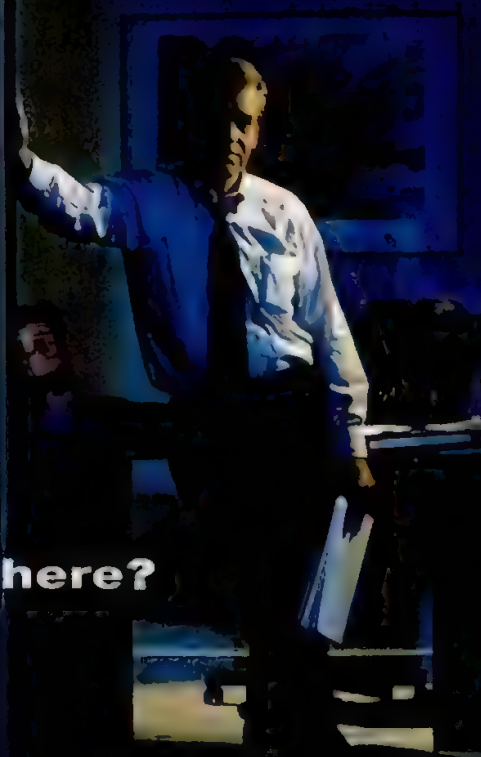
interoperability with existing Windows NT 4 directory service installations, a Windows 2000 domain controller can play the role of a Windows NT 4.0 backup domain controller (BDC) and receive domain account replication from an existing Windows NT 4.0 primary DC. This lets Windows NT 4 user workstations send username/password authentication requests to a Windows 2000 DC acting as a BDC in the Windows NT 4.0 domain.

Active Directory's trust management features and hierarchical design enable it to scale well to significantly larger organizations than did the Windows NT 4 directory service. Active Directory supports important open standards. By significantly enhancing the Windows NT environment's scalability and introducing a general purpose distributed data store architecture, Active Directory is arguably Microsoft's most significant enterprise-level Windows advancement to date. **PC**

Eric Greenberg is author of Network Application Frameworks, published by Addison Wesley Longman. You can reach him at ericgr@seinedynamics.com.



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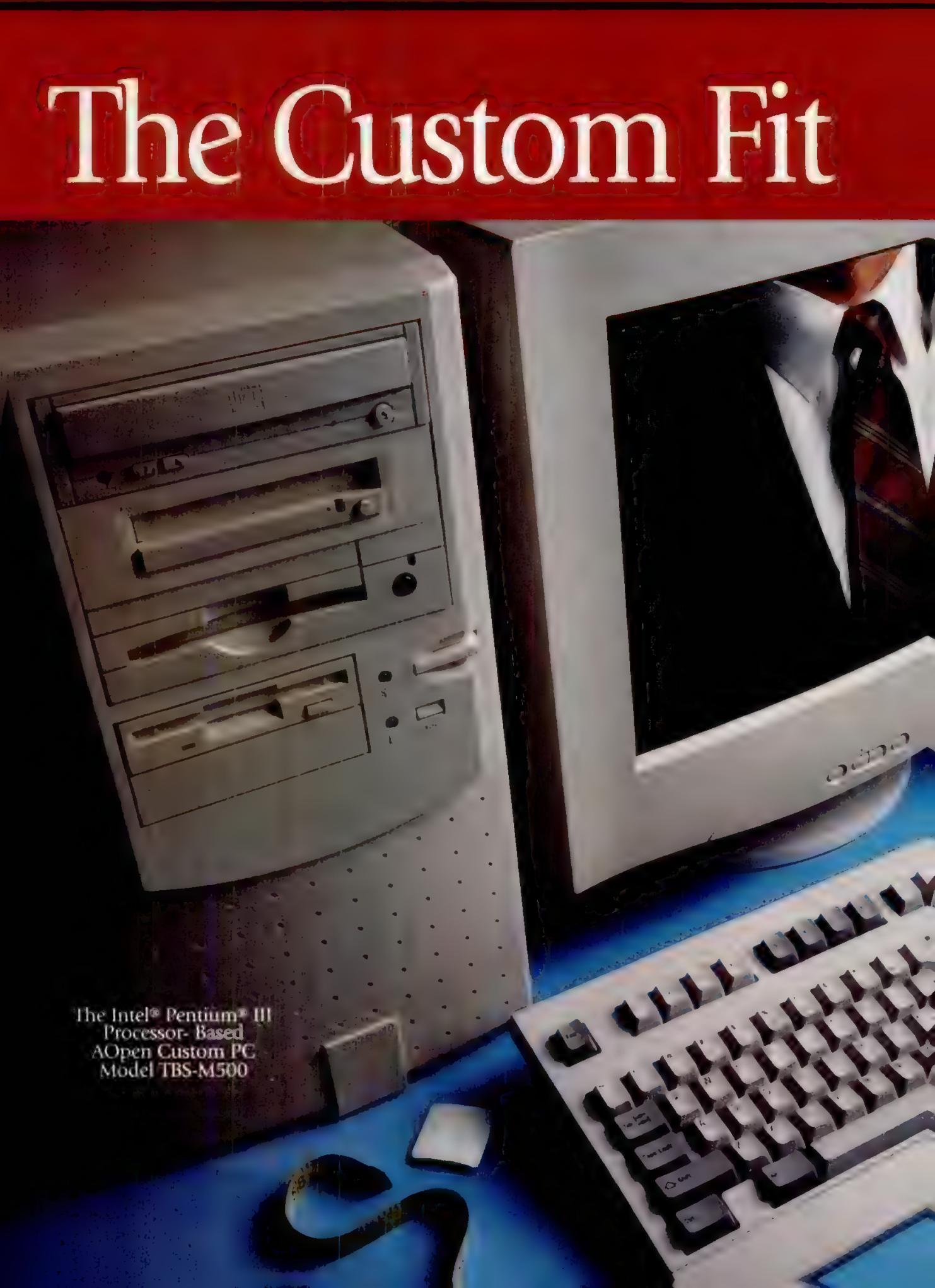
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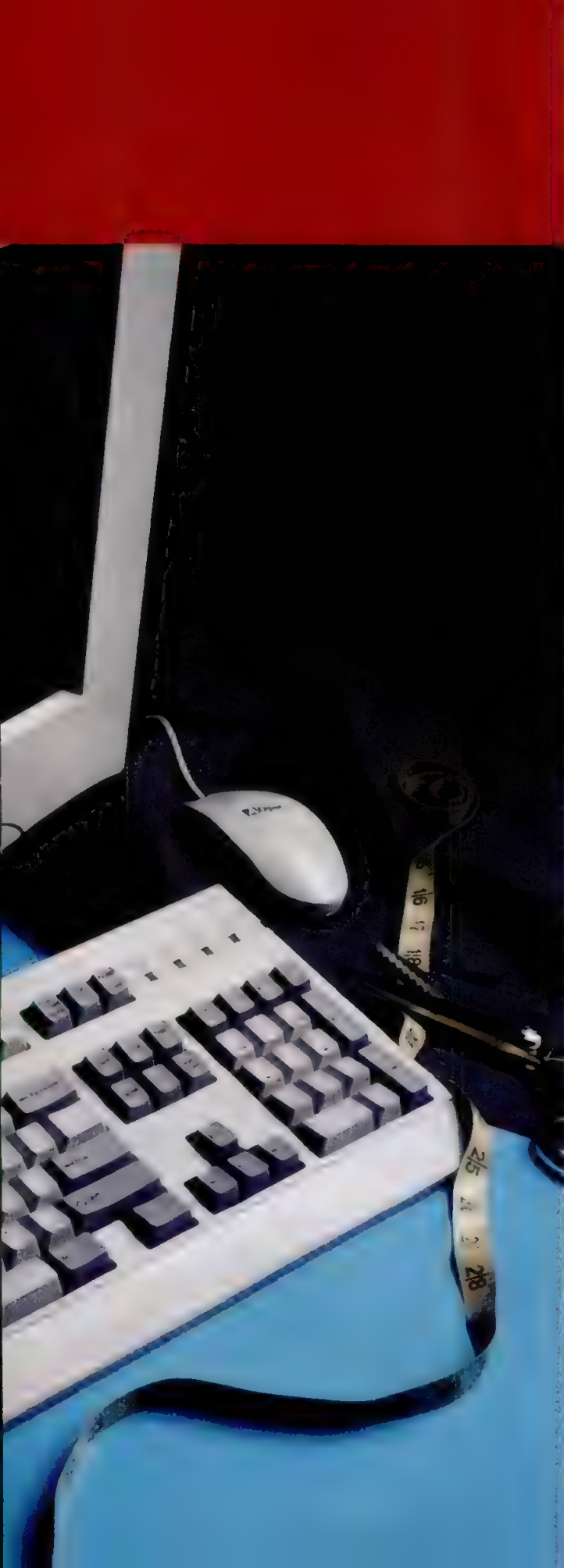
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Dynamic IP Addressing in Windows

By Neil Randall

No matter what kind of computer you have, and no matter what kind of connection you use, two things are certain if you're on the Internet: First, you're using the networking protocol known as TCP/IP. Second, your computer has a unique Internet Protocol (IP) number. Without them, you can't be on the Internet. Generally, the TCP/IP part is no problem. In Windows, you install it either during initial setup or through the Network applet in Control Panel. But how does your computer get a unique IP number? That's a different story entirely.

Your computer receives its IP number from your Internet service provider (ISP). The ISP has a block of such numbers, which are allocated by a higher-level (*upstream*) service provider. At the top of the hierarchy for IP number allocations are the three regional registries: APNIC for Asia and the Pacific (www.apnic.net), RIPE for Europe (www.ripe.net), and ARIN (www.arin.net), the American Registry for Internet Numbers, for the Americas and part of Africa. These agencies work in conjunction with the Internet Assigned Numbers Authority (www.iana.org), currently funded by the U.S. government's National Science Foundation.

Once an ISP has its block of IP numbers, it has the authority to assign them to its individual subscribers. These could be organizations, which need a range of IP numbers, or individuals, who typically require only one. The ISP can allocate IP numbers either statically or dynamically (once assigned, the numbers are usually referred to as *IP addresses*). If you have a 24-hour connection to the Internet, it's likely that you have a static IP address, meaning an address that never changes. On the other hand, if you connect to your ISP through a modem, you're probably assigned an IP address dynamically—a different one each time.

Dynamic allocation is the most common for modem users, but an ISP doesn't have to allocate IP addresses this way. Each dial-in subscriber could be—and in the early days of commercial ISPs often was—allocated a static

IP. But this scheme is inefficient, simply because a dial-in user is a temporary user. Whether the user stays connected for 15 minutes or 15 hours, it's still a temporary connection. And although many readers of this magazine no doubt stay on the modem for hours at a time, many Internet users log in only once every few days. Those 10-hours-per-month accounts exist for a reason, after all.

If an ISP has 10,000 dial-in subscribers, it

/rfc2131.txt). DHCP was designed specifically to allow greater allocation flexibility than earlier protocols such as BOOTP (Bootstrap Protocol). DHCP is in fact based on BOOTP, but it offers extended features, including the ability to *lease* IP numbers for limited periods of time, thereby allowing the DHCP server to recover and reuse those numbers.

Providing IP addresses to dial-in accounts is probably the most common use of DHCP, but it is not the only one. For example, you can also use DHCP to let computers on your LAN share an Internet connection. Microsoft Windows 98 Second Edition offers this configuration through a feature known as Internet Connection Sharing (ICS). When installed, ICS acts as a DHCP server to the computers on the LAN, dynamically assigning them IP addresses from a pool of IP numbers in the 192.168.x.x range, which has been reserved for use in private networks. The computer on the LAN that serves these numbers



needs 10,000 IP numbers if it uses a purely static allocation scheme. But if that ISP has only, say, 500 dial-in lines, it needs only 500 IP numbers, since only computers logged on to the Internet require an IP address. The solution is for the ISP to assign IP numbers only to computers actually logged in, and only for as long as they're logged in. When a computer disconnects, the ISP recovers an IP number and reassigns it to the next subscriber who dials in.

ENTER DHCP

To make it possible to assign IP numbers dynamically, in 1993 the Internet Engineering Task Force came up with the idea of the Dynamic Host Configuration Protocol, more commonly known as DHCP. Originally defined in request for comment (RFC) 1531 and 1541 ([ftp://ftp.isi.edu/in-notes/rfc1541.txt](http://ftp.isi.edu/in-notes/rfc1541.txt)), the protocol's most recent definition can be found in RFC 2131 (<http://ftp.isi.edu/in-notes>

in turn obtains an IP address through DHCP (from its ISP) and in effect shares this IP number with the rest of the LAN. It processes each client request to the Internet as if the request were coming from the IP number, using the private IP numbers to keep track of which LAN client made the request and should receive the response.

HOW DHCP WORKS

DHCP is a client/server protocol (as are TCP/IP, HTTP, FTP, and other Internet protocols). A DHCP client makes requests of a DHCP server, which responds to the client in preconfigured ways. A computer acts as a DHCP client if its IP address is set to 0.0.0.0, or in Windows' case if its TCP/IP settings are configured for a server-assigned IP address (see Figures 1 through 5 for configuration instructions). When the client connects to the network, a four-phase DHCP communication



takes place. (From this point on, we'll look only at a situation in which a computer dials in to an ISP, but all other DHCP allocations operate by the same principles.)

The first phase is *initialization*. Because the client does not have an IP address but requires one in order to perform Internet actions (such as connection to a Web site), it must locate a DHCP server that will issue one. In our dial-in case, the client connects to the modem, then broadcasts a DHCPDISCOVER message over the line and onto the network to locate a server. If the ISP has more than one DHCP server, all available units respond to the request by sending a DHCPOFFER

message, assigning the IP address and the duration of the lease. If the offered IP address has become unavailable in the meantime (because of timing), the server sends a DHCPNAK (nonacknowledgment) message instead, forcing the client to start over with a DHCPDISCOVER broadcast. In fact, the client might initiate this new broadcast on its own: After receiving the DHCPACK packet, it issues an Address Resolution Protocol (ARP) broadcast to the network to determine if the offered IP address is in use (again, because of the timing). If the address is in use, the client will send a DHCPDECLINE message to the offering server and immediately send a new DHCPDISCOVER message.

Next come the *renewal* and *rebinding* phases. As mentioned,

two timers, T1 and T2. By default, T1 is set at 50 percent of the lease time and T2 at 87.5 percent. When the lease has reached the T1 point, the client enters the renewal phase, issuing a DHCPREQUEST packet to the currently granting server asking for a new lease. If the server responds with a DHCPACK packet, the lease is renewed and T1 and T2 change accordingly (the original T2 is never reached). If the server does not respond, the client will continue using the current IP address until it reaches T2. At this point, the client enters the *rebinding* phase and broadcasts a DHCPREQUEST packet to all the servers. Any server that responds with a DHCPACK renews the lease and

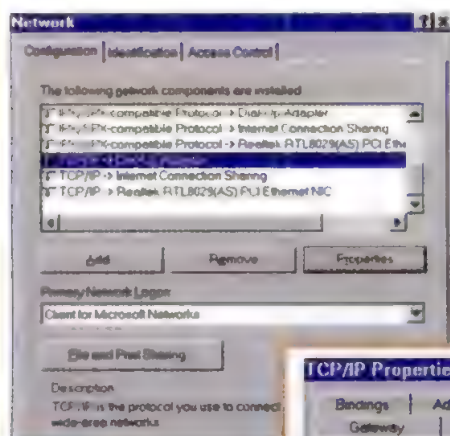
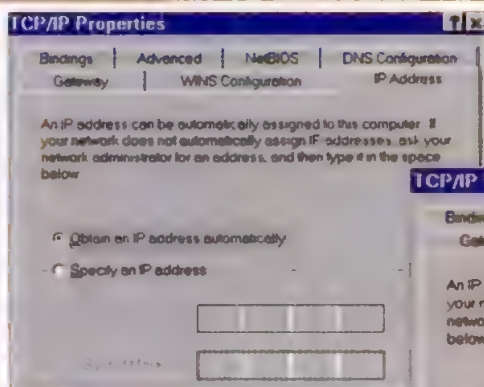
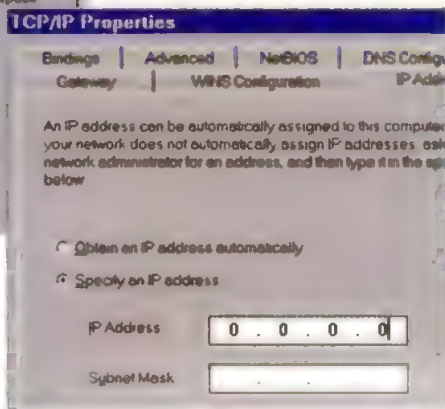


FIGURE 1: Open Control Panel and then the Network applet. Click the *Configuration* tab, and find the TCP/IP component in the network components pane. If you have more than one device that uses TCP/IP, all will be listed. Select the one you wish to configure. For many users, the only component available will be TCP/IP -> Dial-Up Adapter, which specifies your dial-up modem (as opposed to, say, a cable modem). Now click the *Properties* button.



FIGURES 2 and 3: The TCP/IP Properties box is where you specify that you'll be obtaining an IP address through a granting server. You have two ways of doing so, as shown in the figures here. The most common way for Windows users (and in fact the default configuration for all TCP/IP setups in Win 95, 98, NT, and 2000) is to click the radio button labeled *Obtain an IP address automatically*. The second way is to click the *Specify an IP address* radio button and type 0.0.0.0 in the IP Address field. Both methods tell your machine to initiate the DHCP communications process but need advice, once a connection with the ISP has been made. Click OK and exit the Network applet. You might be asked to restart Windows.



packet that contains an IP address and an offer of lease length. The lease length, established by the server's administrator, is the length of time the client can have the IP address.

The client responds with a DHCPREQUEST broadcast indicating which server's DHCPOFFER it will accept. The broadcast is necessary so that all other servers know they won't be needed and can stop waiting for a response. The accepted server finishes the initialization phase by issuing an acknowledgment in the form of a DHCPACK

a lease is the amount of time the server will let the client use the IP address for. Leases can be set for a very brief period of time, unlimited time, or anything in between. The reason the lease time isn't simply called "expiry time" is that leases can be renewed as the connection is in progress.

The DHCP client (not the server) operates



FIGURE 4: You can also configure DHCP connections in Win 95 and 98 through the Dial-Up Networking window, found in My Computer. In fact, if you have more than one dial-up account, you can and should configure each of them separately. Find the specific connection in the Dial-Up Networking window, right-click on the icon, and select the *Properties* item from the menu.

then becomes the current granting server. If no server responds, the lease expires and the client no longer has an IP number. Basically, it's just been kicked off the Internet.

The final phase is called (perhaps optimistically) *graceful shutdown* and occurs when a client no longer needs the assigned IP address. The client issues a DHCPRELEASE

message, telling the server that it can have its IP number back. As you might expect, gracefulness is not always the way things happen; if somebody picks up the phone line and cuts you off, your ISP's server has to wait until your computer's next T2 point to reclaim the address.

Figures 1-5 show you how to set up a DHCP client. We look specifically at Windows

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95/98 systems, but the procedure for Windows NT 4 is very similar. Windows 2000 handles network configurations in a different location: Instead of going through the Control Panel, you configure your modem and LAN connections through the Network Connections folder on the desktop.

DHCP is not a complex protocol, and setting up a DHCP client is easy. But there's no mistaking the importance of protocol. Without it, IP address allocation and configuration would be much more difficult for both



user and administrator, and IP numbers, already in short supply, would run out much more quickly. **PC**

Neil Randall is a contributing editor of PC Magazine.

Both Windows NT 4.0 and Windows 2000 Server ship with DHCP service built in and can act as DHCP servers. We don't have space to cover this service in any detail here, but essentially, administrators configure it through the DHCP Manager found in the Administrative Tools folder. Through this manager, an administrator can specify the range of IP numbers to be served (including several ranges to exclude) and the length of the leases. Of course, Windows NT can't serve IP addresses it doesn't already own, so the organization needs a block of assignable IP numbers before establishing the server.

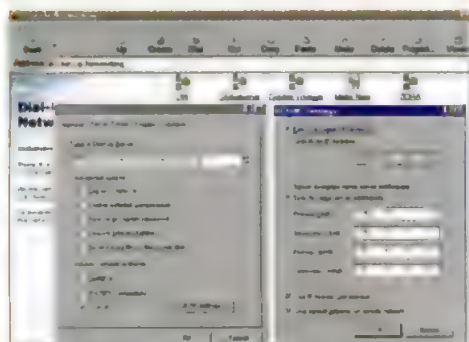
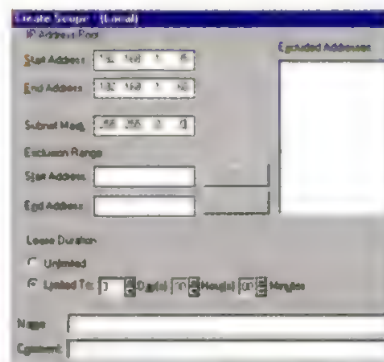


FIGURE 5: On the *Properties* dialog, shown here on the left, click the *TCP/IP Settings* button. At the top of the *TCP/IP Settings* dialog are two IP address radio buttons with functions identical to those available through the *Network* applet. Below this area is a related space, where you configure name server (or DNS server) addresses. Again, you can type them manually, or you can tell your machine to request them from the server.

Although server-assigned DNS numbers aren't part of DHCP itself, the ideas are clearly similar. One of the benefits in both cases is that network administration (the ISP's job in this

case) is easier. If the block of IP addresses changes, or if the DNS server numbers change, the client (namely, you) isn't required to change TCP/IP settings manually. Once you connect, the servers can assign these numbers automatically.



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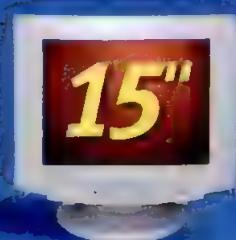
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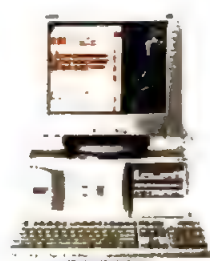
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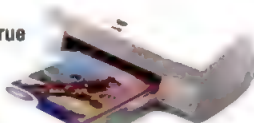
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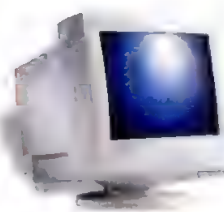
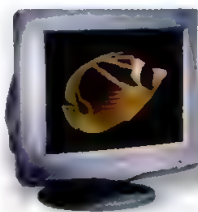
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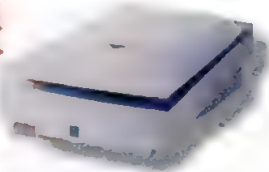
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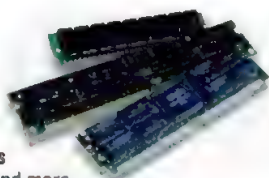
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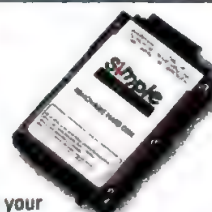


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Add \$90 for external version. Drive kit - requires controller.

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4.5GB	7200	IBM	IBM34560N	\$209
9.1GB	7200	IBM	IBM39130N	\$339
9.1GB	7200	Seagate	ST39140N	\$325
9.1GB	7200	Seagate	ST39173N	\$395
18.2GB	7200	IBM	IBM318350N	\$735
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9.1GB	5400	IBM	IBM39130N	\$329
9.1GB	7200	Seagate	ST39140N	\$325
9.1GB	7200	Seagate	ST39173N	\$380
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18.1GB	7200	IBM	IBM318350N	\$709

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9.1GB	7200	IBM	IBM39130N	\$325
9.1GB	10,020	IBM	IBM39130N	\$325
9.1GB	7200	Seagate	ST39175LW	\$375
9.1GB	10,000	Seagate	ST39103LW	\$514
18.2GB	7200	Seagate	ST318275LW	\$705
18.2GB	7200	IBM	IBM318350U2	\$715
18.2GB	10,000	IBM	IBM318350U2	\$995
18.2GB	10,000	IBM	IBM318350U2	\$879
18.2GB	10,000	Seagate	ST318203LW	\$835
36.4GB	7200	IBM	IBM36400S	\$1255
36.4GB	10,000	IBM	IBM36400S	\$1639
36.4GB	7200	Seagate	ST136403LW	\$1390
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40X	Toshiba	XM6502B	79	\$64		
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32X	Plextor	PK32S250m	85	\$149
40X	NEC	CDR3010	85	\$89
40X	Toshiba	XM6401B	79	\$95
40X	Plextor	PK40TS	85	\$139

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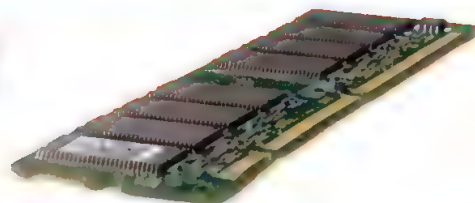
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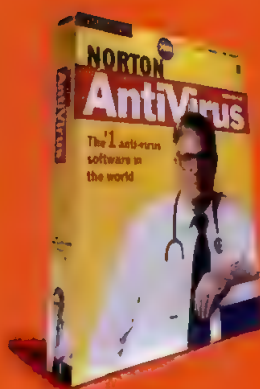
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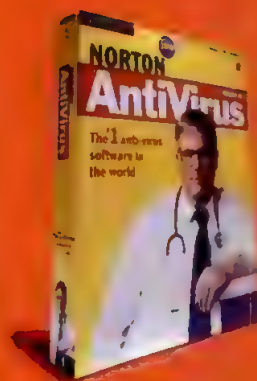
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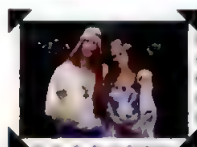


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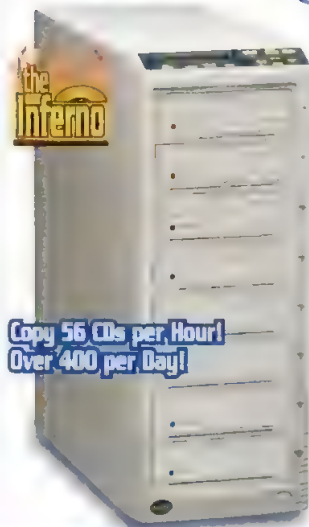
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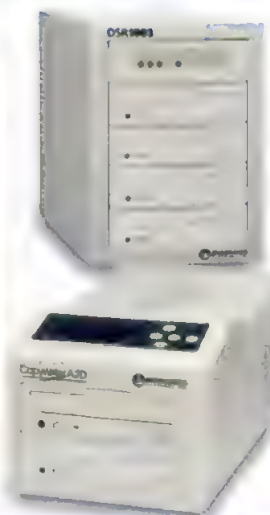
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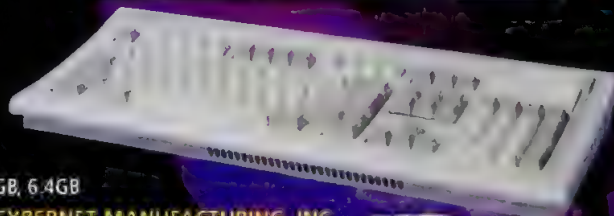
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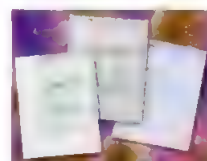
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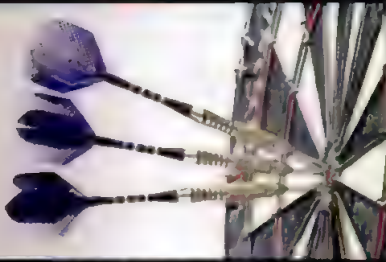
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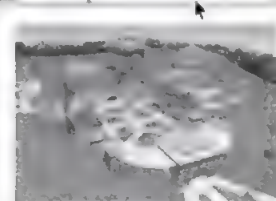
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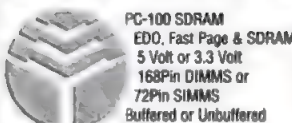
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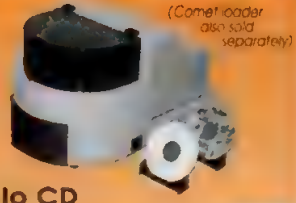
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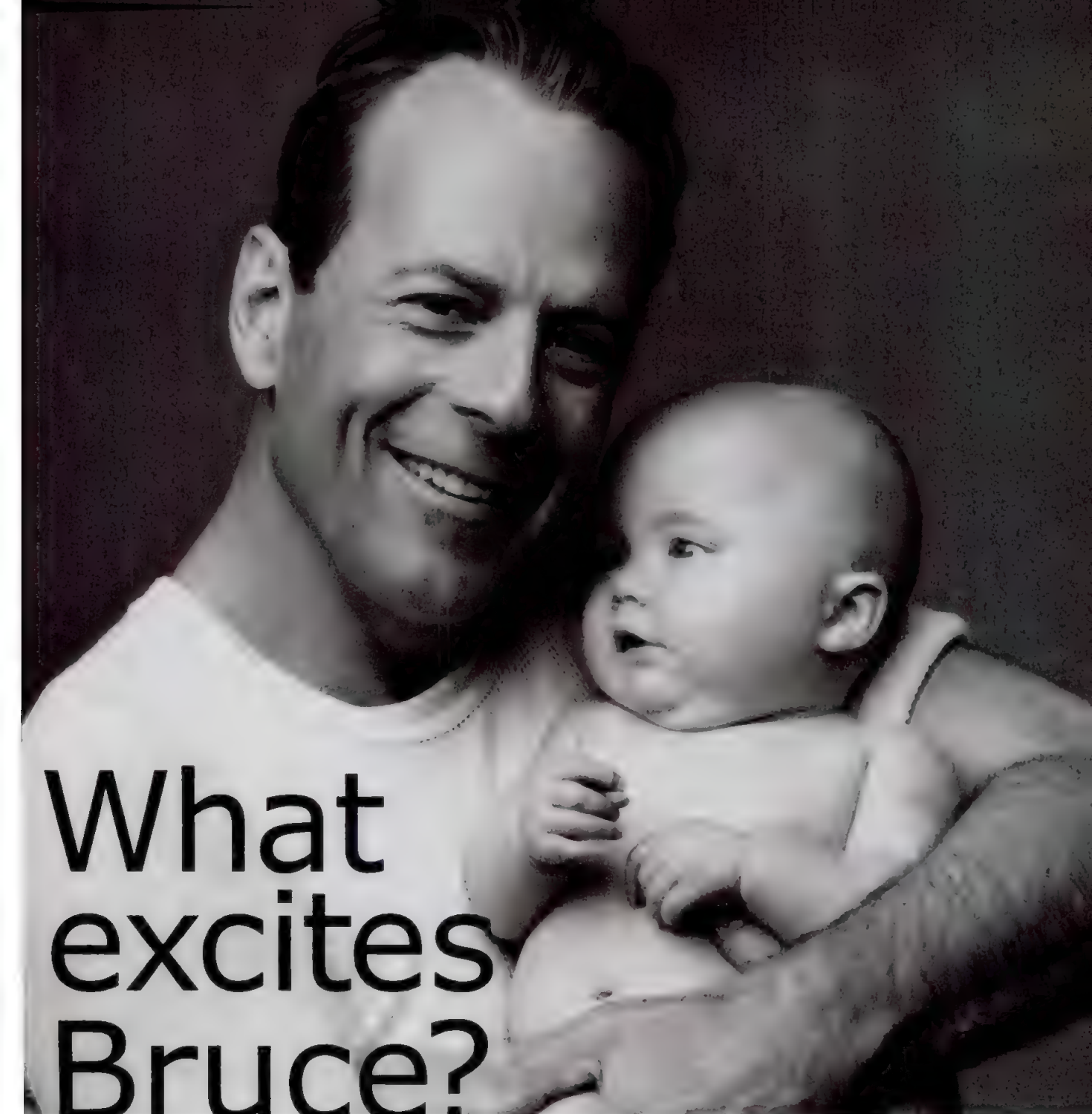
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If your children can mercilessly frag enemies in *Quake* but still haven't conquered the multiplication tables, it's time to put your computer to better use. There's a wealth of educational software that entertains while instructing; your kids can learn from the cornucopia of information packed on today's CD-ROMs without even realizing they're doing work.

We've chosen to highlight programs for different age groups, from preschool through high school. A new product in The

Learning Company's Reader Rabbit line, for example, targets 3- to 7-year-olds, while Grolier Interactive's *Nature: Virtual Serengeti* is best for kids 9 and up. But they all combine fun with facts, which should inspire Tommy and Tina to drop those joysticks and start learning.

Reader Rabbit's Complete Learn to Read System

The Reader Rabbit software series, from The Learning Company, has long provided innovative and fun ways to help young

READER RABBIT'S COMPLETE
LEARN TO READ SYSTEM
★★★★★ 360 Street.
Ages 3 to 7. The Learning Company.
800-973-5111, www.learningco.com.



ILLUSTRATION BY NISMAN ANGULIAN

AFTER HOURS

dren, Reader Rabbit's Complete Learn to Read System is an affordable and easy-to-use package for parents and educators alike.—*Sharon Nash*

Freddi Fish 4: The Case of the Hogfish Rustlers of Briny Gulch

Freddi Fish is back and more clever than ever—and along with his friend Luther, he is ready to take the kids on an underwater Western adventure. In *Freddi Fish 4: The Case of the Hogfish Rustlers of Briny Gulch*, the hogfish of Freddi's cousin Calico have been stolen, and Freddi and Luther have to get them back.

Children take Freddi and Luther on a trip around town and the surrounding seascape, where they meet up with wacky characters who help them on their way. But this game is not just about cute animated characters.

Designed for kids ages 3 to 8, *Freddi Fish 4* is the perfect blend of story, fun, and learning. Sort of like a *Myst* for the younger set, it presents puzzles and situa-

tions that require reasoning, cooperation, and memory skills.

Children interact with other characters simply by clicking. And there are clues everywhere—even expressions and gestures can lead to helpful hints—so kids experience how being thorough can help with problem solving. The clues, however, may or may not be needed right

away; the lesson learned here



ments and characters, while older kids will appreciate the challenge of solving the puzzles.—*Adam Asch*

Mia: The Search for Grandma's Remedy

In Kutoka Interactive's *Mia: The Search for Grandma's Remedy*, Mia the mouse's grandmother has fallen ill. Being a mouse, Mia cannot visit a local pharmacy, so she'll have to collect the items she needs to help Grandma from around the house. To do this she needs to find "sparklies" to buy the appropriate ingredients.

is about sifting through and ordering information. The bundled guide for parents and teachers helps adults structure activities based on themes from the game. For younger kids especially, parental guidance will prove helpful, as some of the puzzles might be a bit hard for 3- or 4-year-olds. On the whole, though, younger kids will love the interactive story ele-

Of course, sparklies are not easy to come by: They must be earned. As a player takes Mia on her search through the house, reading and phonics activities appear. Reach the stated goal for a particular activity—match, for example, five rhyming words and objects—and Mia gets a sparkly. Eventually, she will have enough to buy the ingredients to help Grandma.

Created for children ages 5 to

PC EDITORS' HOT LINKS

www.pcmag.com/hotlinks

There are plenty of great educational programs on the market, but your child's learning doesn't have to stop there. An increasing number of Internet sites and hardware devices are devoted to fostering children's reading, writing, and arithmetic skills. We help you separate the wheat from the chaff.

► Book Adventure

www.bookadventure.org

Reading is a fundamental skill kids can't start learning too early. Book Adventure challenges children with reading comprehension quizzes that help them choose the

books they want to read and win prizes. With a list of over 3,000 titles in categories ranging from science fiction to poetry, this site is sure to have something for children of all ages.

► HomeworkCentral.com

www.homeworkcentral.com

HomeworkCentral.com's front page includes three descriptive icons: one for first through sixth grades, one for middle and high school, and one for college and beyond. Each link connects you to a collection of study guides that take a close look at current events, history, the arts, the natural sciences, and so on. The guides are well written though

spotty, and pop-up ads refresh every 30 seconds or so—an annoying distraction. There are also links to other Internet resources scattered throughout the sections.

► I Spy

www.scholastic.com/ispy

For the littlest ones, the online site for Scholastic's I Spy line of books includes several games intended to let preschoolers and toddlers get acquainted with the Internet and the Web. Unfortunately, the site is little more than a vehicle for Scholastic book sales, and a poorly designed one at that. What toddler will casually surf by and decide to buy a book? Also, I Spy's great book format does not translate well into a mouse-over type of game.

► KBGear

www.kbgear.com

KBGear (formerly kidBoard), the manufacturer of a popular line

of graphics tablets and keyboards for kids, has expanded its scope to other areas. New products, released in conjunction with Little Tikes, include SkidDoodle, a child-friendly graphics tablet, and kidCam, a digital camera designed to please the little ones. The products are affordable and innovative, and they will teach valuable skills while entertaining.

► Oregon Scientific

www.oregonscientific.com

Oregon Scientific manufactures a range of consumer electronics devices, including laptop computers targeting children ages 5 to 14. The line includes the Oregon Scientific Princess Cleo, designed specifically for girls (though even this younger crowd may find it a bit—well, prissy), which includes proprietary software designed to foster spelling, grammar, and math skills. List price: \$69.95. Now why can't adult laptops cost so little?

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9, *Mia: The Search for Grandma's Remedy* has four levels of difficulty. In addition, *Mia*, the other characters, and the house are nicely designed and rendered, for a real sense of interactivity. The characters are engaging, and the dialog is designed to get kids thinking.

Though Kutoka's minimum system requirement for *Mia* is a 100-MHz Pentium, we recommend using at least a Pentium II machine for faster rendering of *Mia*'s nicely designed 3-D graphics. Game play can also be slowed a bit by indecision about the next move; we often had to refer to the comprehensive parents' guide. If an adult can get a little confused, what's a 5-year-old child to do?

We also had a sense of disjointedness in the game play. Reading games pop up at unexpected moments, for example. The true test of a good educational software product is whether it will keep a child's attention without her realizing that she's learning. *Mia*, though very well done, will not do this for younger kids. For the older set, however—and especially for the girls—*Mia* should be a lot of fun.—AA

Bean There Grown That

Curious Company's *Bean There Grown That* is a truly interactive educational package. Not only does your 8- to 12-year-old interact with the software, but real-world activity is an integral component of the program.

Bean There is a sort of botany lab in a box. It comes with a petri dish, a handful of beans, a magnifying glass, and a ruler. Children are expected to cultivate a dish of bean plants over the course of ten days, learning all about biology from the software along the way. And a teachers' edition allows the

program to function as an aid in the classroom.

Clever concept aside, the program has a few shortcomings. The introduction is long-winded, and a nerdy lab instructor, replete with



horn-rimmed glasses and a lab coat, is annoying, though the younger set will find him funny.

The interface consists of four panes: The Instructor window contains the lab guy; the AutoScribe is a report builder, in which your child types observations and thoughts; and the InfoDrive features wacky, informative movies on such topics as the world's largest trees and why beans give you gas. The fourth pane has the Glossiraptor, which is basically a botanical glossary.

There are pause, play, and rewind buttons to control the video in the lab assistant's window. Rewind skips to the beginning of a segment, but you can't skip ahead. Students cannot skip to future days either, which ensures that they will conduct the experiments in order.

On the whole, Curious Company's *Bean There Grown That* is didactic and entertaining. The program will ultimately help your children learn about biology, and you can bet that they will enjoy their legumes that much more come dinnertime.—JAK

MP Express

Like a scaled-down version of Microsoft PowerPoint, Bytes of Learning's MP Express lets kids ages 8 and



There are four templates: a title screen, a bullet list, a blank page, and a scrolling credits page. A tool palette contains buttons that let the presenter place various multimedia elements such as pictures on each page. There are also two buttons, labeled *import* and *browse*, that bring these elements into the program.

Browse brings in only files from special MP Express CD-ROMs. Our review package came with two—*Living Deserts & Rainforests* and *On the Brink: Endangered Species*—but you'll have to buy these and other disks for around \$30 each.

Import brings in files from your hard disk—ostensibly the image, sound, and movie files (such as QuickTime, AVI, GIF, JPG, TIFF, and WAV files) that your child has found on the Web or elsewhere. Clearly, the *browse* and *import* buttons could have been filtered down to one, eliminating any potential confusion.

The program does a good job of letting kids resize graphics and mix audio levels of sound tracks, sound effects, and voice-overs. All your child has to do is get past the convoluted *import* functions in MP Express—and you'll have to get past its steep price tag (\$50 street).—JAK

Nature: Virtual Serengeti

Grolier Interactive's *Nature: Virtual Serengeti* makes it fun for kids 9 and up to learn vocabulary words, geography lessons, and information on the animals that populate the African wilds.

As an assistant to George Page, host of the PBS series "Nature," your adventurer is sent to base camp in the Masai Mara, a national reserve that

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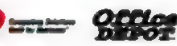
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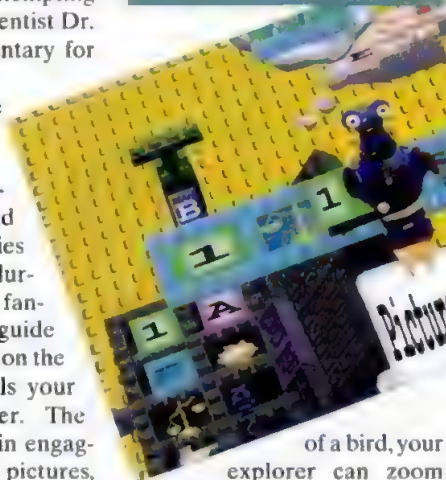
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makes up part of the Serengeti Plain. The goal is to film the many animals that make up this diverse ecosystem, attempting to finish esteemed scientist Dr. Elgin Carp's documentary for the TV show.

There are three tools that prove useful along the way: a compass, a video camera that stores and plays back the movies your child captures during the journey, and a fanciful electronic field guide containing brief notes on the more than 60 animals your child will encounter. The guide's entries contain engaging and informative pictures, sounds, and videos.

Your child moves through QuickTime VR frames, but it's the ability to pan through the scenery quickly or slowly that heightens the sense of immersion. At the roar of a lion or call



of a bird, your explorer can zoom into the frame to see a 10-second movie. The films contain one- or two-sentence captions that help kids place them in the appropriate part of Dr. Carp's multimedia notebook. One hitch: The films must fit the

more general concepts Dr. Carp is trying to document. Does a movie of a Jackson's chameleon rolling its eyes independent of each other illustrate an adaptive body part, an attempt to avoid other threatening animals, or just a quirk of Mother Nature?

Capturing the videos seems easy enough at first, but finding the correct video will have your children padding through the Serengeti for hours—and learning in spite of themselves. There's just one oversight: No pith helmet was included.—JAK

ToonTalk

ToonTalk was designed to teach basic programming concepts to your 5- through 15-year-old. Though it is a unique product

developed with the best of intentions, ToonTalk comes across as amateurish; it is confusing and far too free-form for its intended audience to use effectively.

The program can be used in two basic ways: games and free play. Games challenge the user to solve a series of increasingly complex puzzles to help Marty the Martian fix his broken spacecraft. Each puzzle teaches a basic programming concept. For example, when Marty asks you to find a "box inside a box inside a box," you're actually in search of a simple recursive data structure. The problem is, ToonTalk does not adequately explain the concepts the program is trying to teach. This wouldn't be so bad if the puzzle itself were presented in such a way that kids could try to solve it logically. Instead, Marty spits out a paltry, one-sentence puzzle goal and sends you on your way.

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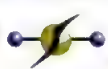
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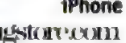
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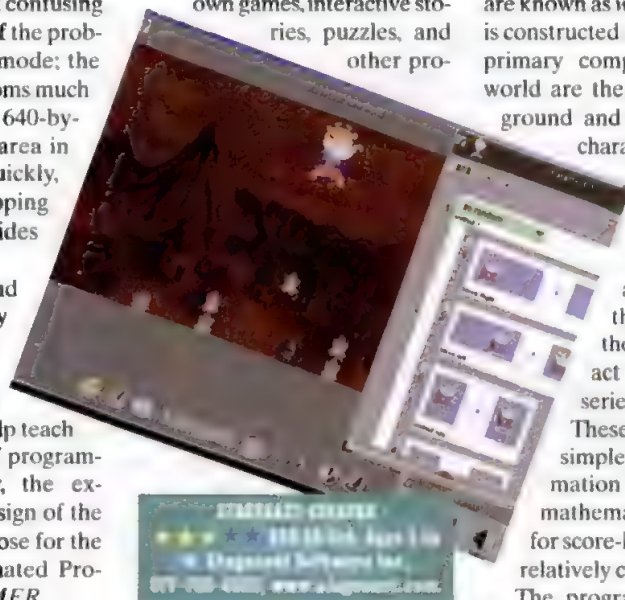
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In free-play mode, kids can create their own programs, games, and fun animations—assuming, that is, that they were able to soak up a modicum of the program's workings during the puzzle games. But confusing lessons are the least of the problems with free-play mode; the cluttered interface looms much larger. Limited to a 640-by-480 screen, the play area in ToonTalk fills up quickly, with objects overlapping and spilling off the sides of the screen.

We don't intend to sound completely down on ToonTalk. There is some good, solid content in this product, which can help teach the basic elements of programming. Unfortunately, the extremely free-form design of the program is just too loose for the age range that Animated Programs is targeting.—MER

Stagecast Creator

Stagecast Creator, from Stagecast Software, is a powerful multimedia authoring tool that lets kids build and share their own games, interactive stories, puzzles, and other pro-



jects. While they're at it, they will learn some basic programming concepts and develop logical-thinking and problem-solving skills.

Projects built with Creator are known as *worlds*. Each world is constructed like a theater. The primary components of each world are the stage (the background and setting) and the characters (objects that interact on the stage). You select a stage, place some characters on it, and then define how they move and interact by creating a series of rules for each. These rules range from simple if-then and animation commands to mathematical calculations for score-keeping and other relatively complex functions. The program can be a bit

overwhelming at first. After all, it can be used to create a multitude of interactive projects, and there are no true templates or wizards to guide you through the process.

A few other issues prevent Creator from being all it could be. For starters, the interface is a bit cold and nonintuitive. Once you learn what each button and window can do, using the program is not so bad, but actually learning all of those functions can take a while. Also, Creator is supposedly suitable for ages 5 to 18, but the interface is far too complex for the younger kids. Finally, even on the fastest setting, Java-based Creator slows to a crawl when you place and animate even a moderate number of characters in a world.

Still, there is no questioning Creator's power and flexibility. And it can make an excellent teaching tool for educators who can master the program's many features.—MER

MOVING?

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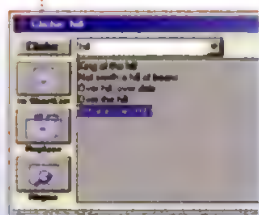
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A Zillion Kajillion Rhymes and Clichés

Though its title probably violates some truth-in-advertising statute, A Zillion Kajillion Rhymes and Clichés is a pretty slick little product. With it, you can look for a word or phrase to help overcome minor bouts of writer's block. The interface is simple, and the search results are often as humorous as they are helpful. The product is not edited for youngsters, however, so beware of occasional adult language in the cliché index. \$79.95 list; Eccentric Software, 800-436-6758, www.eccentricsoftware.com.

I Love Science

Part of a three-title series from DK Multimedia, I Love Science is a humorous educational program that can help kids master the basics of physics, chemistry, and other scientific disciplines. Intended for children ages 7



through 11, I Love Science is basically well designed and helpful, but it can be a bit uninteresting at times. The other titles in the series are I Love Math and I Love Spelling. \$19.95 list; DK Multimedia, 888-342-5357, www.dkmultimedia.com.

Madeline 1st & 2nd Grade Math

This two-title set stars the familiar Madeline and tries to teach basic math skills on a trip to the Louvre. The game includes 18 activities, each designed around math skills, problem solving, and logical thinking. Some activities are confusing, but on the whole this is a solid package, especially for the



price. \$19.99 list; The Learning Company, 510-792-2101, www.learningco.com.

StudyWorks! Mathematics Deluxe

A powerful study tool built around MathSoft's excellent StudyWorks! package, Mathematics Deluxe is an electronic study guide and notebook for junior high and high school students. The product covers every math subject, from prealgebra to calculus and statistics. Online features let students discuss problems and concepts with peers and educators from around the country. StudyWorks! Mathematics Deluxe can be very intimidating, but once you learn how to use it, it can also be a terrific learning aid. \$39.95 list; MathSoft, 617-577-1017, www.mathsoft.com.



Coming Up

What's in the Next Issue of *PC Magazine*

CPU Face-Off

Intel is churning out new iterations of its processors at a record pace, AMD is introducing a chip that will give the Pentium III a run for the money, and Cyrix ain't dead yet. Can't make sense of it all? Our annual CPU roundup will pit all the players against one another to find out which processors are hot right now and what you can look forward to.

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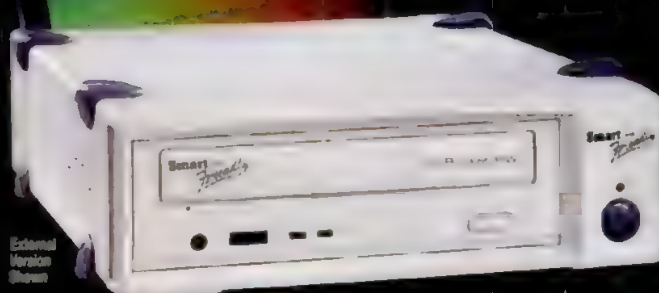


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Edited by Don Willmott



It's the Y2K Bug created by Todd Ramquist, who decorated it with CDs, chips, and 500 flashing LEDs.

Watch Your Virtual Mouth!

Spotted at the Bell Labs text-to-speech synthesis test Web site (www.bell-labs.com/project/tts/voices.html): "If you plan to enter text which our system might consider to be obscene, check here to certify that you are old enough to hear the resulting output."

Gravel And Twigs Cereal - 37 items found

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- ☐ Nabisco Spoon Size Shredded Wheat
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And the slogan of the month award goes to...

Computer Cholesterol?

Faithful reader Daniel Tonks was wandering the halls of a Toronto hospital when he saw this note taped to a computer at the nurses' station: "Turn off the computer every night in order to unclog the memory." Let's hope they know more about the human body than they do about PCs.



Everybody sling! Inventor Robert Jaeger has come up with Wrist-Wings arm supports, modeled here by his wife, Sigrid.



"...so if you have a message for someone, you write it on a piece of paper and put it on their refrigerator with these magnets. It's just until we get our e-mail system fixed."

If your entry is used, we'll send you \$50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, 28 E. 28th St., New York, NY 10016-7930 or via e-mail to don_willmott@zd.com. Winners this issue: Lance Hodges, Rob Jaeger, Max Mednick, Todd Ramquist, Daniel Tonks, and Jeff Yuen.

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